# Technical Section Abstracts

9:00 a.m. - 5:00 p.m., Saturday, May 2, 1992
College of Business Administration
Note: Abstracts of posters follow podium presentations by section.

## A. Zoology
Only Morning
9:00 am, Saturday, May 2, 1992
College of Business Administration 125
Miles A. Coburn, Presiding

**9:00 FIELD INVENTORY AND TAXONOMIC ANALYSIS OF FRESH WATER GASTROTRICHA FROM EASTERN OHIO. CRAFT, Laura G., Department of Zoological and Biomedical Sciences, Ohio University, Athens, OH 45701**

Until now, only 3 species of Gastrotricha have been identified from the State of Ohio, compared with some 300 species known from freshwater habitats the world over. The present study includes lakes, ponds and marshes in southeastern Ohio, and bogs and fens in northeastern Ohio. Superficial sediments and submerged vegetation were collected and kept in aquaria in the laboratory. From these, over 150 specimens were extracted, mounted on slides and recorded on Super-VHS cassette tapes, using differential interference contrast optics and high-resolution videomicroscopy. Individual images were converted to computer files, using frame grabbing hardware. These files permit descriptions and drawings to be made, and morphology to be analyzed by means of analytic and statistical software. All descriptions refer back to the fully taped images; diagnoses differentiate between species from the study areas in Ohio and from others in the literature. At least 30 species have been found, comprising 8 of the 9 most commonly represented genera and involving several new species. This work will also allow evaluation of differing taxonomic changes proposed in recent monographic studies by Kisielewski (1991, from Brazil) and Schwank (1991, from Germany), which have partially destabilized the generic level taxa in the freshwater sector of this phylum.

**9:15 *MUSELLIFER SUBLITORALIS* (GASTROTRICHA, CHAETONOTIDA) FROM ALASKA: A MORPHOMETRIC STUDY. HUMMON, William D., Dept. of Zoological and Biomedical Sciences, Ohio University, Athens, OH 45701**

*Musellifer sublitoralis* Hummon, 1969 was described from two specimens collected at 14-20 m depth in different summers, amid marine muds of the San Juan Archipelago, Washington. Recently, numerous specimens have been found in similar habitats of southeastern Alaska by Alan Decho, Tom Shirley and John Fleeger. These preserved specimens have been mounted on slides and studied at 20-100 x magnification, using differential interference contrast optics. Select specimens were also recorded on Super-VHS cassette tapes, using image-enhanced, high-resolution videomicroscopy, and several additional specimens were analyzed by means of Scanning Electron Microscopy at 600-1400 x magnification. A principle components analysis of morphological variability was performed on ten body characters from some 40 specimens: total body length; lengths of pharynx, intestine and furca; widths of head, neck, trunk and furcal base; and length and width of the mid-dorsal neck scales. The results were compared with those from a similar study on a second species, *Musellifer profundus* Vivier, 1974, which was first described from a single specimen found at 200 m in the northern Mediterranean Sea, but which had later been found in abundance at shallower sublittoral depths in Scotland and in the Polish Baltic (see Hummon and Brient, 1991). A comparative study of the two species will be published.

**9:30 THE ROLE OF CHEMICAL SENSES IN SEED DISPERSAL BY ANTS. Stacey L. Myers. Department of Biology, Kenyon College, Gambier, OH 43022.**

The basis for induction of seed dispersal by ants was examined through behavioral and physiological methods. 19 sylvan ant colonies were tested for olfactory and gustatory response to seeds by monitoring the time spent by individual ants with treatments of no seed, exposed seed, and unexposed seed. Results indicated that ants do not identify seeds by olfaction; instead they respond to seeds only if the seeds are blindly stumbled upon and "tasted." Ants spent 165.9 ± 42.6 seconds with exposed seeds that were "tasted," but only 5.7 ± 0.8 seconds with seeds that were not "tasted." This gustatory response refutes the use of the word "attractant" for seed chemicals. Initial electroantennogram assays, recorded from ants in response to olfactory and gustatory application of mixed diolein, supported the behavioral data. Olfactory application produced no consistent result, while gustatory application elicited consistent hyperpolarization.

**9:45 A BAROMETRIC PRESSURE CHAMBER FOR INSECT BEHAVIOR STUDIES. R. J. Anderson and R. Louie. Agric. Res. Service, U.S. Dept. of Agric. and Departments of Entomology and Plant Pathology, respectively. OSU-OARDC, Wooster, OH 44691.**

A cylindrical metal container (54.6 cm high x 40.6 cm in diameter), open at the top end, was used as the pressure chamber. At the open end, a collar made of 1.9 cm thick plywood and a rubber gasket which was coated with vacuum grease was used to support a lexan-lid (1.3 cm thick) and a 1.9 cm thick plywood retaining ring. The transparent lid allowed access and illumination into the chamber. Air pressure inside the air-tight chamber was controlled by inflating or deflating a rubber tube at the bottom of the chamber. A timer-actuated solenoid valve regulated air to the tube. Temperature, humidity, and pressure were recorded with a datalogger and down-loaded to a computer for analysis. Pressure control was precise. In two 12-hour tests with controls set at 2.29 mm mercury per hour decrease and 3.05 mm mercury per hour increase, chamber pressure dropped by 27.48 mm of mercury and rose by 36.60 mm of mercury, respectively, as expected. When the controls were set for constant pressure, the pressure fluctuated no more than 1.02 mm of mercury in a 12-hour period.

**10:00 TOXIC ACTION OF DIAZINON ON THE GILLS OF BLUEGILL SUNFISH, *LEPOMIS MACROCHIRUS*. Hiran M. Dutta, Todd Zeno and Chelliah R. Richmonds, Department of Biological Sciences, Kent State Uiversity, Kent, OH 44242.**

Histopathological changes of the gills of bluegills exposed to sub-lethal concentrations of diazinon were investigated in this study. Fish were exposed to 15, 30, 45, 60 and 75 mg/l of commercial diazinon for a period of 24 hours. Routine histological techniques were performed to assess the damage. Lifting of the epithelial layer from gill lamellae and dilation of blood sinuses were observed after an exposure to 15 mg/l of diazinon. Gills from fish exposed to 30 mg/l were afflicted with mild forms of hyperplasia. Necrosis and epithelial rupture were observed when the dosage was increased to 45 mg/l. Extensive lamellar fusion was found in the gills of fish exposed to 60 and 75 mg/l of diazinon. Mucous cell hypertrophy and clavate lamellae were also observed at these exposure concentrations. These histopathological changes could result in hypoxia and problems with ionic and acid-base balance.

**10:15 ONTOGENY OF THE WEBERIAN APPARATUS OF THE CYPRINID FISH *LUXILUS CORNUTUS*. Lidia M. Futey & Miles M. Coburn. Dept. of Biology, John Carroll Univ., Univ. Hts., OH 44118**

We investigated the ontogeny of the component structures of the Weberian apparatus, an otophysan synapomorphy, in the cyprinid fish *Luxilus cornutus*. We directed special attention to the development of the claustrum and supraneurals. A graded developmental series of 125 lab reared specimens was preserved from 9-75 days post-fertilization. Counterstaining enabled both cartilage and bone to be viewed through early developmental stages. Photomicrographs indicate the presence of three cartilages (supraneurals 2, 3, and 4). These coalesce to form a single structure, which later undergoes perichondral ossification to form "supraneural 3 and 4" and parts of "neural arches 3 and 4" (sensu Fink & Fink, 1981). The homology of the claustrum has been long debated. Our study indicates that the claustrum initially has a cartilage component and this may be homologous to the first supraneural.

**10: 30 DARTERS (PERCIDAE) OF THE OHIO RIVER: OHIO'S SHORELINE ASSEMBLAGES FROM MILE 66.2 TO 487.2**
**Randall E. Sanders and James P. Stricko, Ohio Environmental Protection Agency, Division of Water Quality Planning and Assessment, 1685 West Belt Drive, Columbus, OH 43228**

During the fall of 1991, near-shore fish assemblages at 20 Ohio River locations (Ohio shore) were sampled by night electrofishing as part of a nongame and endangered species survey. Throughout the survey, low water and turbidity levels provided optimal sampling conditions. Darters represented 3.5% (354) of the total number of fish collected and 16.9% (10) of the total species richness. The number of individuals/number of sites collected for each species were: *Percina caprodes* (192/19); *P. phoxocephala* (40/10); *P. shumardi* (34/5); *P. copelandi* (21/7); *P. s. sciera* (1/1); *Etheostoma caeruleum* (38/10); *E. blennioides* (21/6); *E. zonale* (5/4); *E. flabellare* (1/1); *E. camurum* (1/1). The highest number of darter species, including a new mainstem record for *Etheostoma camurum,* and total individuals was collected from RM 393.9 near Manchester, OH. The mean number of darters species and total individuals collected per location was respectively, 3.2 (range 1-7) and 17.7 (range 3-68). The diversity of darter species at a location tended to increase with greater distance downstream from a dam, but showed no relationship to distance sampled (0.50-1.25 km). Most of the darters were collected from rocky substrates in the shallowest waters against the shoreline. The distribution and abundance of *Percina phoxocephala* has markedly increased since first collected from the mainstem during 1988. Near-shore boat electrofishing during the night, as opposed to day, is an effective sampling technique for collecting darters in the Ohio River as well as many other mainstem species.

**10:45 COMPETITION AND PREDATION IN TWO SPECIES OF *AMBYSTOMA* LARVAE. Brodman, Robert D., Department of Biological Sciences, Kent State University, Kent, OH 44242**

The densities of the coexisting larvae of *Ambystoma jeffersonianum* and *A. maculatum* were manipulated in laboratory aquaria and field pens to evaluate the relative effects of intraspecific and interspecific competition and to investigate the possible existence of temporal or spatial competition avoidance mechanisms. This study suggests that high larval densities increase mortality and both species negatively affect each other when raised together. Intraguild predation is a significant cause of mortality, but the overall effect of the interaction is competition. For both species, interspecific competition is less intense than intraspecific competition which leads to stable coexistence. Microhabitat preferences indicate that both species tend to prefer unvegetated benthos when raised allopatrically and that *A. maculatum* migrate at night. In the presence of *A. jeffersonianum, A. maculatum* shifts its microhabitat preference to vegetated bottoms and no longer moves nocturnally. Leaf litter and vegetation which provide refuge decreases the mortality of larvae. These data are consistent with the scenario that the behavioral plasticity of *A. maculatum* reduces interference competition in the presence of the more aggressive *A. jeffersonianum.* The outcome of stable coexistence is due to the spatial partitioning of microhabitat.

## A. Zoology
## Only Afternoon & Business Mtg.
## 1:30 pm, Saturday, May 2, 1992
## College of Business Administration 125
## Clyde D. Barbour, Presiding

**2:00 REGULATION OF ECDYSONE 20-MONOOXYGENASE ACTIVITY IN MANDUCA SEXTA: EVIDENCE FOR THE INVOLVEMENT OF THE SECOND MESSENGER CYCLIC GMP. Ekem T. Efuet, Lydia J. Worford, Daniel P. Keogh and Stan L. Smith. Department of Biological Sciences, Bowling Green State University, Bowling Green, OH 43403**

Ecdysone 20-monooxygenase (EC 1.14.99.22) is the insect cytochrome P450 dependent steroid hydroxylase responsible for the conversion of the molting hormone ecdysone to its more active metabolite 20-hydroxyecdysone. Previous studies in our laboratory have demonstrated that the activity of this enzyme fluctuates in a stage and tissue specific fashion during the postembryonic development of the tobacco hornworm, *Manduca sexta.* During the last larval stadium, midgut ecdysone 20-monooxygenase undergoes a 50-fold increase in activity temporally coincident with genomic reprogramming from larval to pupal syntheses and the onset of the wandering stage of development. The 50-fold increase in midgut monooxygenase activity exhibits a head critical period temporally coincident with the release of prothoracicotropic hormone, is predicated on m-RNA and protein synthesis and can be elicited in competent head or thorax ligated pre-wandering animals by injections of ecdysone or the ecdysone agonist RH 5849 (1, 2-dibenzoyl-1-*tert*-butylhydrazine). Recent experiments suggest that the second messenger guanosine 3':5'-cyclic monophosphate (cyclic GMP) may be involved in the regulation of midgut ecdysone 20-monooxygenase activity. Midgut tissues pre-incubated with dibutyryl cyclic GMP were found to exhibit significantly higher levels of enzyme activity than untreated controls. Similarly, injections of dibutyryl cyclic GMP into competent head or thorax ligated pre-wandering animals elicited increases in midgut enzyme activity when co-administered with suboptimal doses of RH 5849. In contrast, and consistent with our model, injections of LY 83538 (6-anilinoquinoline-5, 8-quinone; an inhibitor of guanylate cyclase) into competent head or thorax ligated pre-wandering larvae significantly mitigated the effects of co-injected optimal doses of RH5849. Funded by grants from Sigma Xi, FRC, Ohio Board of Regents, and NIH.

**2 :15 EFFECTS OF THE JUVENILE HORMONE MIMICS HYDROPRENE AND METHOPRENE ON INSECT CYTOCHROME P-450 DEPENDENT STEROID HYDROXYLASE ACTIVITY. John R. Crooks, Lydia J. Worford and Stan L. Smith, Department of Biological Sciences, Bowling Green State University, Bowling Green, OH 43403.**

The postembryonic development of insects is regulated in a complex fashion by the interplay of several groups of hormones including the brain neuropeptide prothoracicotropic hormones (PTTH), the steroidal molting hormones (ecdysteroids), and the juvenile hormones (JH). PTTH acts on the prothoracic glands (PG) to elicit the synthesis and release of the molting hormone ecdysone. This compound in turn is hydroxylated to the more physiologically active hormone 20-hydroxyecdysone by a cytochrome P-450 dependent steroid hydroxylase system, ecdysone 20-monooxygenase (EC 1.14.99.22), located in several tissues peripheral to the PG. Radioassay quantification of ecdysone 20-monooxygenase during the postembryonic development of the tobacco hornworm, *Manduca sexta,* has revealed that this enzyme activity fluctuates dramatically in a stage and tissue specific fashion. During the last larval stadium of the tobacco hornworm fat body and midgut ecdysone 20-monooxygenase undergoes a 10-fold and 50-fold increase in activity, respectively. Fat body activity increases during the feeding stage (days 0-4) while the increase in midgut monooxygenase activity occurs temporally coincident with the onset of the wandering stage and genomic reprogramming of the tissues from larval to pupal syntheses (day 5 of the stadium). JH are known to affect ecdysteroidogenesis via actions at both the brain and PG. Since it is not known if the JH actions on the PG involve steroid hydroxylases, it was of interest to examine the effects of the synthetic JH mimics hydroprene and methoprene on fat body and midgut ecdysone 20-monooxygenase activities. Topical application of these JH analogs on whole, head or thorax ligated animals (as well as tissue pre-incubations with these compounds) revealed that these insect growth regulators effected significant alterations in the normal levels of fat body and midgut monooxygenase activities. Accordingly, this is the first demonstration of an interendocrine effect of juvenoids on insect cytochrome P-450 dependent steroid hydroxylases. Supported by grants from Sigma Xi, FRC, Ohio Board ot Regents, and NIH.

**2:30 LIGHT RESPONSES OF THE SEA ANEMONE *CONDYLACTIS GIGANTEA.* Matthew Chan and Charles F. Shaffer, Department of Biology, Wittenberg University, Springfield, OH 45501.**

Observations were made on the posturing and movement behaviors of the sea anemone *Condylactis gigantea* in sea water tanks, sea water tables and in the open sea. Anemones in the open ocean contracted their tentacles and stalk during periods of intense sunlight and expanded their tentacles and stalk during twilight and night. In the sea table experiments, anemones given a choice between bright white light and shade tended to remain at the interface between the two areas. Neither positive nor negative phototropism was noted in tank experiments where anemones were exposed to red or blue light and then allowed to move over time. In conclusion, *Condylactis g.* is capable of responding to variations in light thru movements over the substrata and by changing its body configuration. The significance of these responses is still uncertain. The work reported here was performed at the Keys Marine Laboratory, Long Key, Florida under support to both authors from the Faculty Research Fund Board, Wittenberg University.

**2 :45 TRANSPLANTATION IMMUNITY IN THE SEA ANEMONE *CONDYLACTIS GIGANTEA*. Charles F. Shaffer, Department of Biology, Wittenberg University, Springfield, OH. 45501**

While graft rejection has been studied in other groups of Cridaria, sea anemones have heretofore proven resistant to transplantation. A newly developed technique for performing epithelial grafts in anemones made possible these studies. Half centimeter square grafts of column epithelium were tucked into incisions made in the translucent collars of *C. gigantea*. The incisions were then sutured shut. Epithelium taken from pigmented regions was used as graft material to facilitate visual assessment of rejection. Allografts made in this manner were universally rejected within four days. Macroscopic signs of rejection included decolorization, erosion and finally a caseous-like necrosis. Microscopically, phagocytic cells of unknown origin were noted within and in the area of the allograft as soon as twenty-four hours after transplantation. The work reported here was performed at the Keys Marine Laboratory, Long Key, Florida under support from the Faculty Research Fund Board, Wittenberg University.

**3:00 SHORT PHOTOPERIOD ALTERS THE NUMBER AND MORPHOLOGY OF IMMUNOREACTIVE GnRH NEURONS IN THE DEER MOUSE *(PEROMYSCUS MANICULATUS)*. Andrew I. Korytko, Jose Marcelino and James L. Blank. Department of Biological Sciences, Kent State University, Kent, OH 44242.**

Seasonally breeding mammals have been a useful animal model for investigations of the neuroendocrine regulation of reproduction. The principle environmental factor causing seasonal gonadal regression is declining (short) photoperiod. The putative sites at which short photoperiod exerts its effects are the anterior and basolateral hypothalamus. This study focused on identifying the effects of short photoperiod on hypothalamic content of gonadotrophin-releasing hormone (GnRH), the putative hypothalamic hormone regulating pituitary-testicular function. Deer mice *(Peromyscus maniculatus)* were used as the animal model for this study since individual males exhibit genetically-based differences in reproductive responses to short-day (SD) exposure. Thus, deer mice provide a model system enabling comparisons of reproductively responsive (R) and nonresponsive (NR) individuals exposed to the same environmental treatment. Using immunocytochemical staining for GnRH neurons, our results demonstrate an effect of SD exposure on the number, optical density and area of immunoreactive (IR) GnRH neurons. Compared to long-day (LD) exposed males, SD significantly increased the number, decreased the density and had a disparate effect on area of IR-GnRH neurons in both R and NR phenotypes. Estimated GnRH content of IR-GnRH neurons, (area * density * number), was significantly higher in R individuals and did not differ between LD and NR groups indicating similar release of GnRH in both reproductively competent groups. Neurons from several hypothalamic loci were also individually assessed and differences in density and area were apparent. These data suggest that neural determinants governing discharge of GnRH are differentially responsive to SD between the two gonadal responsive groups and that these differences are restricted to individual hypothalamic loci.

**3:15 INVESTIGATION OF Y-ORGAN SECRETIONS AND FEEDBACK REGULATION IN THE CRAYFISH, *ORCONECTES IMMUNUS*. Heather Howard and Dr. Thomas C. Jegla, Kenyon College, Gambier, OH 43022.**

The Y-organ (YO) produces ecdysteroids, hormones which regulate the molting cycle in crustaceans. Previously thought to be only ecdysone (E), recent literature shows that YOs of various crustacean species secrete other ecdysteroids. This investigation involved two questions: 1) what compounds are being secreted by YOs in the crayfish, *Orconectes immunus*, and 2) is YO production regulated by a feedback mechanism? To address the first question, HPLC and RIA were used together to qualify and quantify the product(s) of YO secretion. YO products were collected *in vitro*, purified on a SEP-PAK LITE solid-phase-extraction cartridge, then injected onto an HPLC analytical column (reversed-phase system). Fractions were collected and sampled for RIA-analysis. 3-dehydroecdysone (3dE) appears to be the major YO secretion, although E is present in smaller amounts. The retention times of E/3dE are very close, therefore this region was re-chromatographed using a methanol:$H_2O$ solvent gradient. The E and 3dE regions are the only ones which showed RIA-sensitivity. Concerning the second question, YOs cultured in 20-OHE (the circulating ecdysteroid) showed a negative correlation of ecdysteroid production with higher concentrations of 20-OHE. Thus, preliminary results suggest a feedback mechanism is playing a role in the regulation of this system.

**3:30 THE ROLE OF VOLTAGE-GATED Ca CHANNELS IN THE Y-ORGANS OF CRAYFISH *ORCONECTES IMMUNIS* Jeff Booth and Dr. Thomas C. Jegla, Kenyon College, Gambier, OH 43022**

Molting is stimulated in crayfish by the Y-organ, located in the anterior portion of the cephalothorax. The Y-organ secretes ecdysone into the the hemolymph. The ecdysone then travels to the epidermal cells of the crayfish. Stimulated by the ecdysone, the epidermal cells begin forming a new shell (cuticle) and induce molting of the old shell. The regulation of the Y-organ comes from a neurosecretory center (x-organs) in the eyestalks. These x-organs release molt-inhibiting factors which prevent the Y-organs from producing ecdysone until the inhibiting factors are no longer made. The details of this inhibition of ecdysone secretion is not fully understood. Calcium, however, does have an effect on ecdysone production in the Y-organs of crayfish. The mechanisms through which calcium regulates ecdysteroid production in the Y-organ of *Orconectes immunis* was the subject of this research. By using various compounds to agonize and antagonize specific voltage-gated calcium channels in the Y-organ, we demonstrated several things. Ecdysteroid production varies with extracellular calcium concentration. Voltage-gated calcium channels occur in crayfish Y-organ cells. The L-channel is the dominant type of voltage-gated calcium channel in the Y-organ. L-channel blockers, verapamil and nifedipine, significantly reduce ecdysone synthesis, thereby mimicking low extracellular calcium concentrations. The L-channel agonist, Bay K8644, significantly reduces ecdysone synthesis and mimicks very high calcium concentrations. And lowering general intracellular calcium concentrations with a calcium buffer (BAPTA-AM) did not affect ecdysteroid production.

**3:45 SEPARATION OF MICROFIBRILLAR PROTEINS IN MAMMALIAN HAIR AND CHARACTERIZATION BY HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY. Peter A. Cutri and Bonnie L. Lamvermeyer. Department of Biology, Denison University, Granville, OH 43023**

The purpose of this study is to perform a microfibrillar protein comparison of hair samples from different mammals with the hope that results from high performance liquid chromatography will allow differentiation of mammals to the genus or species level. Extraction of hair microfibrillar proteins from pulverized hair samples was performed with a nitrogen-flushed reducing buffer by the buffer-hair ratio of 100:1 and incubated before homogenization. This is followed by an overnight incubation under a nitrogen blanket. Non-soluble materials should be precipitated after centrifugation. This material was washed and lyophilized several times before storing. The supernatant was treated with iodoacetic acid in order to alkylate the free sulfhydryl groups. The resultant product was deionized and the proteins isolated by the standard zinc ion precipitate method. The collected proteins were then analyzed by reversed-phase high-performance liquid chromatography. The interpretation was performed on a Hewlett-Packard HPLC system.

**4:00 SEXUAL DIMORPHISM IN HOOVES OF *ODOCOILEUS VIRGINIANUS*. Tisha L. Samosky and Bonnie L. Lamvermeyer. Department of Biology, Denison University, Granville, OH 43023**

The sexual dimorphism of the *Odocoileus virginianus* hoof was analyzed to establish whether there was a difference in the size and shape of hooves of male and female deer. Data were collected from the confined white-tailed deer population of the National Aeronautics and Space Administration's (NASA) Plum Brook Station near Sandusky, Ohio, and the free-ranging white-tailed deer of central Ohio. The difference between confined and free-ranging deer was also considered. Measurements were taken from the right front hoof and the right rear hoof. The length and the width of each of the two toes of each hoof were recorded. It was found that there was not a statistically significant difference between males and females of similar weights and ages. There was a significant difference between the measurements of free-ranging and confined populations ($0.05 > p > 0.001$).

**4:15 ANALYSIS OF AGE STRUCTURE OF ENCLOSED AND FREE-RANGING *ODOCOILEUS VIRGINIANUS* IN OHIO. Carla M. Price and Bonnie L. Lamvermeyer Department of Biology, Denison University, Granville, OH 43023**

An attempt was made to determine if there is a significant difference in the age structures of enclosed and free-ranging *Odocoileus virginianus* in Ohio. The samples consisted of 141 deer from the fenced National Aeronautics and Space Administration's (NASA) Plum Brook Station in Sandusky, Ohio and 65 free-ranging deer from various Ohio counties. The data were obtained from deer harvested during a public hunt at Plum Brook and the annual firearm season in Ohio. Tooth wear and replacement were examined

to determine age. The majority of deer harvested from Plum Brook were females because only antlerless licenses were issued, while the majority of the free-ranging deer were males. A t-test showed the results to be statistically significant (p= 0.035), with the Plum Brook herd having a higher average age. Social hierarchies within deer populations may contribute to these results. For example, others have shown that yearling males are forced to the periphery of the herd by dominant adult males, possibly increasing hunting related mortalities in this age group of males.

**4 : 30 CORRELATION OF NUMBER OF CORPUS LUTEA IN ODOCOILEUS VIRGINIANUS WITH AGE AND WEIGHT DURING THE REPRODUCTIVE SEASON. Jeffery W. Cranston and Bonnie L. Lamvermeyer. Department of Biology, Denison University, Granville, OH 43023**

White-tailed deer that remain in fenced areas such as the National Aeronautics and Space Administration (NASA) station at Plum Brook, appear to develop and function differently than free-ranging deer. The corpus lutea (red lesions left behind on the surface of the ovaries by developed oocytes) count was compared with the age and/or whole weight of white-tailed deer taken within the two week span surrounding the height of the reproductive season for deer. The corpus lutea were counted and recorded. If no lutea were found, a zero value was given for that particular animal. After the data were tabulated, a Pearson Product-Moment Correlation Coefficient test between the dependent variables of age and lutea number was run. Also, a correlation test was run between the whole weight and lutea number. The first test revealed an r-value of 0.3623 which is significant at an alpha value of 0.05. The second test revealed an r-value of 0.3446 which is also significantly correlated at the 0.05 level. The results of these tests give evidence that the number of lutea present is influenced by the age and the weight of the animal.

**4:45 KIDNEY FAT AS AN INDICATION OF THE NUTRITIONAL STATUS OF THE WIHITE-TAILED DEER, *ODOCOILEUS VIRGINIANUS*. Tshali Iithete and Bonnie L. Lamvermeyer. Department of Biology, Denison University, Granville, OH 43023**

This study examined the relationship between the amount of fat surrounding the kidney (kidney fat) and the nutritional status of the deer, *Odocoileus virginianus*, within an enclosed NASA facility. One hundred and fifty deer were studied. The kidney fat was measured by carefully weighing the kidney with the surrounding fat; then peeling the cooled fat from the kidney and observing the difference, i.e. weight of kidney fat. The age and sex of the animal were also noted. It was determined that age and sex did not have a predictable impact on the results. Yearling deer sometimes had more kidney fat than 2.5 year olds. Sex and age were thus determined as independent variables.

**5:00 ANALYSIS OF BRACHYGNATHIA IN INBRED AND FREE-RANGING WHITE-TAILED DEER, *ODOCOILEUS VIRGINIANUS*. Melissa L. Carter and Bonnie L. Lamvermeyer. Department of Biology, Denison University, Granville, OH 43023**

One hundred adult and juvenile deer from the National Aeronautics and Space Administration (NASA) facility at Plum Brook were examined for evidence of brachygnathia, a shortening of the lower jaw. Thirty-six free-ranging adult and juvenile deer were sampled during the one week gun hunting season throughout the state of Ohio. The results indicated the variable age was significant (p< .004), and the variable jaw length was not significant (p< .200). The correlation coefficient 0.1512 (p = 0.05), represented a slight significance correlation between age and shortening of the lower jaw.The significant values supported the hypothesis that brachygnathia might be higher in frequency among inbred deer as compared to free-ranging deer. These results may suggest the presence of homozygous recessive genes in the NASA-Plum Brook herd but this is based on examination of only females since only doe permits were issued. The frequency and severity of the disorder in the 1991 sample represents a decline from earlier years. It is hypothesized that the removal of dominant males by hunter selection in prior hunts may have been a factor in increasing genetic variability and decreasing homozygosity.

**5:15 PREDICTION OF WHOLE WEIGHT FROM DRESSED WEIGHT OF *ODOCOILEUS VIRGINIANUS*. Scott E. Seeman and Bonnie L. Lamvermeyer, Department of Biology, Denison University, Granville, OH 43023**

Whole and dressed weights of white-tailed deer from an enclosed population located at the National Aeronautics and Space Administration's Plum Brook Station near Sandusky, Ohio were correlated in order to develop an equation that would allow prediction of whole weight from dressed values. The regression equation y = 4.14 + 1.29x, when y equals whole weight and x equals dressed weight, was determined. This equation is based mostly on data from does since antlerless only permits were issued on the station in 1991. This equation was compared to others derived from data collected during years at the Plum Brook facility including both sexes and all age categories.

## A. Zoology
## Poster Session
## Saturday, May 2, 1992
## College of Business Administration Concourse

**BOARD A**

**9:00 HEMICASTRATION EFFECTS ON THE FAT BODIES OF THE RED-SPOTTED NEWT, (NOTOPHTHALMUS VIRIDESCENS). C. J. V. Smith, Mira Lee, and Linda L. Baranowski-Smith, The University of Toledo, Toledo, OH 43606.**

Since the early 1900's a controversy has existed concerning the function of the fat bodies of amphibians. The fat bodies are definitely influenced by the season and nutritional state of the animal. In the red-spotted newt, a normally functioning gonad appears to be dependent on the presence of the adjacent fat body. This experiment was designed to determine if the absence of one gonad affects the weight of the adjacent fat body. Experiments were conducted at four different times throughout a year (January, March, June, and October). Male newts were divided into four different treatment groups: control fed, control starved, castrated fed and castrated starved. The left testis was removed at the start of the experiment; the animals were held at room temperature (20C±2) and observed for 5 weeks. The results indicated that during June and October removal of the gonad led to an increased weight of the adjacent fat body with little difference in response between fed and starved animals.

**BOARD B**

**9.00 GROWTH RESPONSE OF GYPSY MOTH LARVAE TO $CO_2$- FUMIGATED WHITE OAK FOLIAGE. W. N. Cannon, Jr., J. H. Barger, USDA-Forest Serv., 359 Main Road, Delaware, OH 43015; and R. W. Hall, Dept. Entomology, The Ohio State University, Columbus, OH 43210.**

Atmospheric $CO_2$ levels are projected to increase from the ambient concentration of 350 ppm to 700 ppm by 2100. Elevated $CO_2$ levels may alter foliage qualities that affect insect herbivore food consumption and growth. We evaluated the weight gain of gypsy moth third instars *(Lymantria dispar L.)* fed 5 days on foliage bouquets from 3-yr-old white oak *(Quercus alba L.)* seedlings fumigated for 25 days with 700 ppm $CO_2$. Leaf water content and nitrogen concentrations were determined for each leaf bouquet and related to larval weight gain. We found that the ability of third instars to convert food into body mass was enhanced when fed foliage fumigated with 700 ppm $CO_2$. Larvae weighed 1.6 times more than those fed foliage fumigated with ambient $CO_2$. There were no obvious changes in leaf nitrogen or water content but the relationships between those and larval weight gain that were evident under ambient conditions vanished when white oaks were fumigated with 700 ppm $CO_2$.

**BOARD C**

**9:00 ENDOGENOUS OPIOID PEPTIDES (EOP) ARE INVOLVED IN THE SUCKLING INDUCED PROLACTIN INCREASE IN FEMALE RATS. Rebecca Parman and Phyllis Callahan, Miami University, Zoology Dept., Oxford, OH 45056.**

The purpose of these experiments was to identify the specific EOP involved in the suckling induced prolactin secretory response. Post-partum, lactating female Sprague Dawley rats were used for all experiments. Animals were implanted with chronic intraventricular (ivt) cannulae into the lateral ventricle. Following a 5-7 day recovery period and one day prior to an experiment, each animal was implanted with a chronic jugular cannulae. On the day of the experiment, pups were removed from the dams. After 6 hours of separation, vehicle or antiserum to beta-endorphin, metor leu-enkephalin or dynorphin (3, 7.5 or 15 ug total protein, ivt in 5 ul) was administered and dams were immediately replaced with the pups. Blood samples were withdrawn immediately prior to antiserum administration and 15, 30, 45 and 60 minutes after the onset of suckling. Antisera to both leu-enkephalin and beta-endorphin attenuated the suckling induced prolactin increase at the 7.5

ug dose and abolished it following the 15 ug dose. Administration of met-enkephalin or dynorphin antiserum did not affect the suckling induced prolactin response. These results clearly indicate that the EOP are involved in the suckling induced prolactin secretory response.

**BOARD D**

**9:00 INTERSPECIFIC COMPARISONS OF INTERPOPULATIONAL GENETIC DIFFERENTIATIONS IN STREAM FISHES (PERCIDAE:ETHEOSTOMATINI). Joseph E. Faber. Department of Zoology, Irvine Hall, Ohio University, Athens, OH 45701.**

A survey of 45 presumptive gene loci was completed via horizontal starch gel electrophoresis for three syntopic populations of *Etheostoma flabellare* and *Etheostoma nigrum* in the Middle Branch of the Shade River, in Athens and Meigs Counties, Ohio. Nine polymorphic loci from *Etheostoma flabellare* and thirteen polymorphic loci from *Etheostoma nigrum* provided allele frequency data indicative of similar levels of significant interpopulational differentiation for both species (Fst, $p<.05$). Interpopulational differentiations may be the result of genetic drift and/or natural selection. Because the two species utilized in this study are closely related and have similar life histories, their syntopic populations may be subject to common gene flow levels and/or selection pressures. This relationship may be reflected by the similarity of the interpopulational differentiation levels of both species.

**BOARD E**

**9:00 SHORT PHOTOPERIOD AND GONADAL STEROID LEVELS ALTER BODY WEIGHT AND FOOD CONSUMPTION IN DEER MICE *(PEROMYSCUS MANICULATUS)*. Andrew I. Korytko, Linda Woods and James L. Blank. Department of Biological Sciences, Kent State University, Kent, OH 44242.**

Most seasonally breeding mammals exhibit annual fluctuations in body weight during the transition from the breeding to nonbreeding season. Laboratory research indicates that photoperiod is the principle proximate factor triggering this change in body weight, although other factors such as food availability and/or temperature influence the magnitude of this change. Exposure to short photoperiod can evoke directional changes in body weight among species even under *ad libitum* food availability and warm ambient temperature. Why photoperiod evokes a variety of seasonal body weight patterns among species is not clear, nor are the possible differences in the regulatory mechanisms that underlie this variation. We investigated the effect of photoperiod and gonadal steroids on body weight changes and food consumption in individual male deer mice *(Peromyscus maniculatus)*. Deer mice were used as the animal model for this study since individuals exhibit genetically-based differences in reproductive responses to short-day exposure. Thus, deer mice provide a model system enabling comparisons of reproductively responsive (R) and nonresponsive (NR) individuals exposed to the same environmental treatment. Body weight and food consumption were measured every two days for each treatment group. Individuals, R and NR, were castrated and given either a testosterone filled or empty silastic capsule, with intact R and NR mice serving as controls. Short day exposure caused a reduction in body weight in both control groups, with R individuals losing the most weight. Food consumption in control animals decreased only in the R group. Testosterone treatment prevented weight loss and consumption was not decreased. Castration decreased body weight in both groups and prevented the decrease in consumption as seen in the R group. These data indicate that seasonal changes in body weight in this species are in part due to changes in photoperiod and concomitant gonadal steroid levels.

**BOARD F**

**9:00 EFFECTS OF ALLOXAN OR STREPTOZOTOCIN ADMINISTRATION ON THE RED-SPOTTED NEWT, *(NOTOPHTHALMUS VIRIDESCENS)*. Cheryl Kushman, Kathleen Berns and C. J. V. Smith, The University of Toledo, Toledo, OH 43606.**

Vethamany-Globus and Liversage (J. Morph. 30:427-447, 1973) showed that alloxan administration to newts alters pancreatic histology, results in detectable levels of urinary glucose, and affects limb regeneration. A study of the influence of alloxan and streptozotocin on certain metabolic changes in newts was conducted. Animals were injected with the two drugs at levels reported to cause pancreatic beta cell damage in animals. Animals were housed at room temperature (22°C+2°) and fed three times per week. Two experiments, lasting up to 8 weeks, were conducted, one being initiated during the spring and the other during the summer months. Upon termination the animals were weighed and measured. Fat bodies and gonads were weighed, blood glucose levels were determined, and pancreatic tissue was evaluated histologically. Results indicated that the control and test blood glucose levels were similar and no gross changes in the pancreatic tissue were noted. Animals treated with either drug in the spring showed a reduction in both fat body to total body weight and gonad to body weight ratios. Summer treated animals showed little effect on the fat body to body weight ratio but a substantial reduction of gonad to body weight ratio when treated with streptozotocin. No differences between control and alloxan treated animals were noted in the summer experiment.

**BOARD G**

**9 00 INFLUENCES OF THE CHANGING ENVIRONMENT ON ODONATES OF THE BASS ISLANDS OF LAKE ERIE. Carmen E. Trisler, 3 Foxworth Lane, Cincinnati, OH 45218**

A survey of Odonates occurring on the Bass Islands was conducted in 1991, seventy years after the first survey was made. Data were compiled from the Franz Theodore Stone Laboratory collection, personal collections and the records from the aquatic entomology classes of 1987, 1989-1991. Present data were compared with data of C.H. Kennedy (1922) and the 1976 data of B. Marback (unpublished). Twelve species present in 1921 are no longer present. Four species are present now (1991) that were not recorded in 1921. Four species that were not present in 1921 or 1991, were recorded at some intermediate time. Changes in the odonate environment are discussed, and species are listed as to date and location collected.

**BOARD H**

**9:00 INVENTORY OF THE NITIDULIDAE IN NATURAL AREAS AND PRESERVES OF OHIO. Roger N. Williams, Douglas S. Richmond, and M. Sean Ellis. Department of Entomology, Ohio Agricultural Research and Development Center of The Ohio State University, Wooster, OH 44691.**

A comparative study among three natural preserves was conducted from early May through October of 1991 to determine if geographical location and habitat type influence the abundance and diversity of nitidulid species. These sites were chosen for their geological features, host plant composition, and their location within the state. The sites were Sears woods, a 99 acre mixed oak woods in transition to a beech-maple climax forest; Carmean woods, a 39 acre oak-hickory woodlot; and Knox woods, a 30 acre mixed mesophytic woodlot. Fifteen collecting techniques were used to document the population of sap beetles (Coleoptera: Nitidulidae) at each site. Approximately 31 species were collected some of which are awaiting determinations. The most species (ca. 26) were collected at Knox woods, 24 at Sears woods, and 24 at Carmean woods. Ten species were considered rare (where less than 10 specimens were collected in all habitats combined over the entire season).

## B. Plant Sciences
## Only Morning
## 9:00 am, Saturday, May 2, 1992
## College of Business Administration 126
## Ralph Boerner, Presiding

**9:00 CYTOLOGY, CYTOGENETICS AND PHYLOGENY OF *PAEONIA* (PAEONIACEAE): A PRELIMINARY REPORT. Tao Sang. Department of Plant Biology, The Ohio State University, 1735 Neil Avenue, Columbus, OH 43210-1239.**

Peonies *(Paeonia)* are well known ornamental plants with large and showy flowers. *Paeonia* consists of more than 30 diploid ($2n=10$) or tetraploid species of shrubs and herbs occurring in five disjunct areas of the Northern Hemisphere: Mediterranean region, central Asia, the Himalayas, eastern Asia, and Pacific North America. A large amount of existing cytological and cytogenetic data including ploidy level, karyotype, C-banding, and artificial hybridization have been synthesized. The karyotypes of the diploid species are very similar and thus phylogenetically less informative. In contrast, variation in C-banding pattern has been observed especially between subgenera *Moutan* and *Paeonia*. Cladistic parsimony analysis of morphological characters suggests a close relationship between North American subgenus *Onaepia* and the eastern Asian shrubby species, *P. delavayi*. All data are brought to bear on the overall phylogeny of the genus.

**9:15 PRODUCING FLORISTIC VEGETATION MAPS FOR A GIS APPLIED TO NATURE RESERVE DESIGN. J.R. Strittholt, Center for Mapping and Department of Plant Biology, The Ohio State University, Columbus, OH 43210.**

With the increased use of geographic information systems (GIS) in natural resource planning, it is important to obtain accurate vegetation information for the computer database in a timely fashion. Through the integration of remote sensing imagery (Landsat TM plus low-altitude B/W aerial photos) and ancillary digital data (soils and topography), production of plant association maps was attempted. The techniques involved in determining floristic compositions using these data types, and their degree of success, will be discussed as they relate to the regional vegetation for both in and around the Edge of Appalachia preserve system (The Nature Conservancy and Cincinnati Museum of Natural History) in Adams County. Information obtained through this study will be incorporated into a broader GIS nature reserve design analysis for this biologically diverse area of Ohio.

**9:30 SIGNIFICANCE OF THE GLACIAL BOUNDARY TO PLANT AND ANIMAL DISTRIBUTIONS IN OHIO. Jane L. Forsyth, Department of Geology, Bowling Green State University, Bowling Green, OH 43403.**

Ohio field biologists have long been aware of the striking influence of glaciation on the distributions of many species of plants and animals in Ohio. Western Ohio is generally flat, with poorly drained, limy glacial and bedrock substrates, while eastern Ohio is hilly, with deep gorges eroded into resistant sandstone bedrock, with spring-fed moisture and infertile, acid soils (with a partial cover of glacial deposits only far to the north and west). Actually, the specific glacial boundary on the published map has been drawn to show the maximum extent reached by glacial ice, marked in some places by clear-cut moraines and in others only by scattered erratic boulders. Consequently, substrates immediately inside this glacial boundary may be glacial materials (as in western Ohio) or non-glacial residual materials (as in eastern Ohio). Unfortunately some scientists, unaware of this variable basis for defining the boundary, have unwisely used it to contrast species on the two sides of the line in places where substrates on both sides are the same, leading to unsound results. Adequate understanding of the true nature of this glacial boundary and an ability to distinguish the different substrate materials, based on either a geologically educated eye or a geological associate, could prevent such misguided interpretations and lead instead to sound and rewarding results.

**9:45 VEGETATION ANALYSIS AND MAPPING OF THE DAVEY WOODS STATE NATURE PRESERVE, CHAMPAIGN COUNTY, OHIO. Pamela A. Frost, James R. Strittholt, and Ralph E.J. Boerner, School of Natural Resources, Center for Mapping, and Department of Plant Biology, Ohio State University, Columbus, OH 43210 U.S.A.**

Davey Woods was dedicated in May 1990 as a State Nature Preserve. This 104 acre (43 ha) site has been referred to as an old growth forest. We quantitatively sampled the vegetation to determine the species composition and structure of community types present there and mapped the spatial extent of each. On the basis of sixty plots, we identified at least three age-by-species composition vegetation types. The oldest is found along the major stream terraces and slopes; tuliptree and black cherry average 69 and 62 cm dbh in this type, respectively, and cottonwoods of over 100 cm dbh are also present. The second type is found in the eastern and northern portions of the preserve; tuliptree and black cherry average 23 and 14 cm dbh, respectively, in this type. The third and youngest age-by-composition type is found in the north central portion; tuliptree and black cherry average 6 and 9 cm dbh here. We present maps of these vegetation types generated by detrended correspondence analysis and speculate on their history and origin.

**10:00 QUANTIFICATION OF LAND USE PATTERNS BETWEEN AND AMONG CLUSTERS OF ECOSYSTEMS IN THE HOCKING HILLS. Francisco J. Artigas and Ralph E.J. Boerner, Environmental Science Program and Department of Plant Biology. The Ohio State University. Columbus, OH 43210.**

Historical aerial photography was used to analyze spatial patterns of land use from the 1930's to the 1980's in Hocking County, Ohio. Topography, soils, hydrology, road networks and land use types for five 650 ha plots were digitized and later analyzed within a Geographical Information System. Land use patterns were quantified as 1) mean number and size of patches; 2) type and amount of edge between patches; 3) connectivity; and 4) fractal dimension. Preliminary results indicate that the size and number of agricultural patches decreases during the 48 year study period; in contrast forest patches increased. Fragmentation of the landscape decreased as homogeneous forest patches became more common. Patch boundaries or ecotones appear and disappear with time as patches are created and changed by humans. Connectivity in these landscape patches increased slightly as patches coalesced. The fractal dimension remained constant, indicating that even though patches decreased in numbers their shapes did not become more or less complex. Finally, methodological approaches are suggested in order to link this spatially explicit data base with a digital simulation model for nitrogen cycling in order to understand through a modeling approach the processes of energy and nutrient flows between and among clusters of ecosystems in a man dominated landscape.

**10:15 CELEBRATING 100 YEARS OF THE OHIO STATE UNIVERSITY HERBARIUM. Ronald L. Stuckey, Professor Emeritus of Botany, The Herbarium, The Ohio State University, 1315 Kinnear Road, Columbus, OH 43212-1192.**

The Herbarium of The Ohio State University, founded in 1891 by William A. Kellerman, Ph.D., has grown to over 450,000 specimens of vascular plants, in addition to significant collections of non-vascular plants—mosses, liverworts, lichens, and diatoms. The Herbarium is a primary source of information for the morphology, taxonomy, phenology, and geography of plants. Originally the Herbarium was housed in Botanical Hall and moved in 1914 to the Botany and Zoology Building. With the beginning of the Herbarium's second century, its development needs to be made even more secure. The statutes of the Ohio Revised Code applying to The Ohio State University provide for the collection, maintenance, and availability of preserved plant specimens. The facility has moved into a newly renovated building at 1315 Kinnear Road, providing a permanent home that has been specially designed for its long-term keeping and modern-day use. To make it truly an outstanding and exceptional facility, and to aid future curators and students, endowment funds must be sought from private sources.

**10:30 THE FIRST CONFIRMED REPORT IN OHIO FOR *CARDAMINE PRATENSIS* L. VAR. *PALUSTRIS* WIMMER & GRAEBNER. Beverly W. Danielson and James K. Bissell, The Cleveland Museum of Natural History, 1 Wade Oval Drive, Cleveland, OH 44106.**

*Cardamine pratensis* var. *palustris* was found May 18, 1991 at Luna Lake in Summit Co. The typical var. *pratensis* is an Eurasian adventive found on roadsides, lawns and wet meadows from Newfoundland to NJ west to OH. The native variety *palustris* is a plant of bogs and swamps and is widely distributed in Canada extending southward to NJ, OH, northern IN and MN. The native variety is considered rare in many states within that range. Earlier reports for Ohio were discounted by Cooperrider (1982). The only known Pennsylvania occurrence of the native variety was found in 1988 by the authors at Edinboro Lake, Erie County in a site remarkably similar to that at Luna Lake. At both sites the plants are restricted to fen meadows along a spring channel at the edge of a glacial lake. Associated species are diverse boreal plants rare to both states including *Carex alata, Carex disperma* and *Carex diandra.*

**10:45 ALLOZYME VARIATION IN THREE RARE SPECIES OF *COREOPSIS* (ASTERACEAE). Mary Elizabeth Cosner and Daniel J. Crawford. Plant Biology Department, 1735 Neil Avenue, The Ohio State University, Columbus, Ohio, 43210.**

The level and apportionment of genetic diversity was estimated for three rare or endemic species of *Coreopsis (C. integrifolia, C. pulchra,* and *C. rosea)* using enzyme electrophoresis. *Coreopsis integrifolia* (sect. *Eublepharis)* has higher total diversity ($H_T$) than either *C. rosea* of the same section or *C. pulchra* of sect. *Palmatae. Coreopsis integrifolia* and *C. rosea* show greater genetic differentiation ($G_{ST}$) among their populations than that found among populations of many other species of *Coreopsis.* By contrast, populations of *C. pulchra* show little genetic differentiation from each other. Total genetic diversity in *C. integrifolia* is greater than that found in many narrowly distributed plant species; however *C. rosea* has only slightly higher, and *C. pulchra* slightly lower, total genetic diversity than other geographically restricted species. *Coreopsis integrifolia* contains the most genetic variation of any rare or endemic species of *Coreopsis* studied to date, while *C. rosea* and *C. pulchra* have lower genetic variability than the rare congener *C. intermedia* (sect. *Coreopsis*), but higher diversity than the paleoendemic *C. latifolia* (sect. *Silphidium*).

## B. Plant Sciences
## First Afternoon & Business Mtg.
## 1:30 pm, Saturday, May 2, 1992
## College of Business Administration 126
## Joanne Rebbeck, Presiding

**2:00 AN ANALYSIS OF THE GROWTH RINGS OF *PINUS CARIBAEA* VAR. *BAHAMENSIS* ON NORTH ANDROS ISLAND, BAHAMAS. Timothy A. Block and Thomas K. Wilson. Department of Botany, Miami University, Oxford, OH 45056.**

In temperate regions trees produce annual rings which make possible the dating of tree-rings. The purpose of this study is to determine the periodicity of the formation of the growth-rings of the sub-tropical *Pinus caribaea* var. *bahamensis* on North Andros Island, Bahamas. Core samples and stem cross sections from ten sites were examined microscopically and growth-ring measurements were made. After standardization, ring-width indices were derived and were adjusted for false and missing rings. Mean site chronologies were constructed. Statistics descriptive of each site were also calculated. This study concludes that the growth-rings of this species on North Andros are annual in occurrence and although intra-annual rings occur, they are generally identifiable as such. Also, there is a marked decrease in the widths of the annual rings after 18-25 years of growth. This should be important in the management of this economically valuable tree.

**2:30 RESPONSE OF WINTER AND SPRING WHEAT TO ALTERING ROOT-ZONE TEMPERATURE. S.A. Al-Hamdani and D.A. Francko. Dept. of Botany, Miami University, Oxford, OH 45056.**

Winter wheat (*Triticum aestivum* L., Chisholm) and spring wheat (Mexico 82), grown at air and root temperature of 25°C, were exposed for 4 days to root chilling at 5°C. A small decline in $CO_2$ assimilation and stomatal conductance was detected from both varieties 24 h after root zone temperatures were dropped to 5°C, followed by steeper significant decrease during the following 3 days. The root chilling effects on $CO_2$ assimilation and stomatal conductance were more distinct in Mexico 82 than in Chisholm. In these experiments stomatal limitation was the major factor inhibiting $CO_2$ assimilation. However, chloroplast starch granules and total nonstructural carbohydrate concentration were significantly higher for both varieties during root chilling. This suggests that high carbohydrate concentration could cause feedback inhibition which would limit $CO_2$ assimilation.

**2:45 CYTOLOGICAL EFFECTS OF LEAD AND ZINC ON MYCORRHIZAL ROOTS OF *PINUS RIGIDA*. Carolyn J. McQuattie, US Forest Service, 359 Main Rd., Delaware, OH 43015.**

Roots of mycorrhizal *Pinus rigida* (pitch pine) appear stunted or discolored after exposure to elevated levels of Pb or Zn. Transmission electron microscopy (TEM) was used to characterize cellular changes in mycorrhizal pitch pine roots due to Pb or Zn toxicity. Seedlings, innoculated with the mycorrhizal fungus *Pisolithus tinctorius*, were grown in sand culture and watered twice weekly with solutions of either 50 ppm Pb, 20 or 75 ppm Zn, or distilled water. Nutrient solution was applied once a week. After 16 weeks, root segments were prepared for TEM. Compared with control roots, Pb-treated roots contained greater amounts of dense phenolic-like compounds in cortical and endodermal cells. Meristem cells of Pb-treated roots had an increased number of vacuoles, and the mitochondria exhibited indistinct cristae. Small Pb deposits were found on fungal mantle walls and on cortical cell walls. Meristem cells of roots treated with 20 ppm Zn exhibited plasmalemma invaginations that contained accumulations of densely-stained compounds. Exposure to 75 ppm Zn resulted in plasmolysis of meristem cells and breakdown of cell wall structure. Deterioration of fungal mantle hyphae was evident after exposure to 20 ppm Zn and complete breakdown of fungal cytoplasm was observed after treatment with 75 ppm Zn.

**3:00 NUTRIENT RESORPTION BY TWO UNDERSTORY PLANTS, *VIBURNUM ACERIFOLIUM* (MAPLE-LEAF VIBURNUM) AND *POLYSTICHUM ACROSTICHOIDES* (CHRISTMAS FERN) IN RELATION TO SITE FERTILITY. M. Loreto Minoletti and Ralph E.J. Boerner, Environmental Science Program and Department of Plant Biology, The Ohio State University, 1735 Neil Ave. Columbus, OH. 43210 U.S.A.**

Most models erected to explain patterns of nutrient resorption prior to leaf senescence have been based on plants growing in high light conditions. Understory plants are subjected not only to variations among sites and times in nutrient availability but must also deal with chronic low light conditions and, in 1991, with chronic drought. We evaluated nitrogen (N) and phosphorous (P) retranslocation in these two understory plants in three forest stands which differed in A-horizon soil by 1.5 pH units, by 3X in extractable P and by 6X in extractable inorganic N. For *V. acerifolium*, we compared resorption dynamic during the drought year of 1991 to the wetter-than-average year, 1985. *P. acrostichoides* is one of the few temperate plants with a wintergreen leaf lifespan; that is leaves live 12-13 months with one cohort of leaves senescing in March-April as the next expands. Thus, *P. acrostichoides* has the potential to realize significant carbon gain during mid-winter thaws. For this species we wished to determine whether the bulk of resorption occurred during autumn or during spring as the next cohort expanded, and to determine if significant winter photosynthesis occurred.

**3:15 EFFECTS OF OZONE ON CARBON ALLOCATION IN SUGAR MAPLE *(ACER SACCHARUM)*. Amy J. Scherzer and Ralph E.J. Boerner. The Ohio State University, Department of Plant Biology, Columbus, OH 43210.**

Several mechanisms for the reduction in growth of woody species caused by ozone have been suggested, including decreased phloem loading and altered source-sink relationships due to reduced assimilation. To test these, sugar maple seedlings were fumigated in open-top chambers for two growing seasons. After 1 season of fumigation with charcoal-filtered air (CF), ambient ozone, or ±15% ambient, seedlings exhibited no differences in short-term allocation of recently fixed $^{14}CO_2$ either 6 or 22 hr after labelling. A second season of fumigation with CF, 1.0X, 1.5X, or 2.0X ambient also resulted in no significant differences. No difference in the phloem-loading capabilities, as determined by the leaf uptake of $^{14}C$-labelled sucrose, further suggested that short-term allocation was unaffected by ozone. However, after 2 seasons of fumigation, 2.0X ambient significantly reduced the allocation of biomass to roots compared to charcoal-filtered plants. Reductions resulted in a 28% decrease in root:shoot ratio. These results suggest that small decreases in carbon translocation are not detectable at significant levels in short-term labelling experiments, but may still be present at subtle levels and capable of reducing allocation to roots over multiple growing seasons. Diurnal leaf carbohydrates consisted mainly of sugar, with very little starch. Plants grown in ambient ozone tended to have the greatest concentrations of leaf total non-structural carbohydrates; concentrations were significantly greater than for plants receiving above-ambient ozone at several times in the afternoon. These effects on carbon allocation suggest that ozone concentrations near ambient levels have the potential to act as a predisposing or contributing factor in sugar maple decline.

**3:30 SPATIAL AND SUCCESSIONAL PATTERNS OF ECTOMYCORRHIZAL AND VESICULAR-ARBUSCULAR MYCORRHIZAL INFECTIVITY OF SOIL IN SOUTHWESTERN OHIO. Ralph E.J. Boerner, Peter N. Leicht, and Jennifer A. Brinkman, Department of Plant Biology, Ohio State University, Columbus, OH 43210 U.S.A.**

Current models of the influence of mycorrhizal infection on succession rely on general levels of infectivity in relation to soil type and ignore the potential of spatial variation in infectivity in plant dynamics. To characterize such spatial patterns, we sampled soils in three 25 $m^2$ plots in five sites at the Miami University Ecology Research Center in SW Ohio: a soybean field, a 5-6 yr. old field, a 10-12 yr. old field, a prairie restoration, and a disturbed site which resembled a reclaimed surface mine. In addition, samples were taken in Hueston Woods, an old-growth beech-maple forest. Samples were taken in a grid system to permit later analysis by spatial autocorrelation and point kriging. Subsamples from each of the $1100^+$ sample points were analyzed for ecto- and VA-mycorrhizal infectivity with pitch pine and switchgrass bioassays, respectively. Duplicate samples were analyzed for KC1-extractable inorganic N ($NO_3$ + $NH_4$) and acetate-extractable P. Semivariograms and kriged plots for infectivity and nutrient status will be presented.

**3:45 AUTUMNAL NUTRIENT RESORPTION BY *GINGKO BILOBA*, A BROAD-LEAFED, DECIDUOUS GYMNOSPERM. Jennifer A. Brinkman and Ralph E.J. Boerner, Department of Plant Biology, Ohio State University, Columbus, OH 43210 U.S.A.**

Autumnal resorption of nitrogen (N) and phosphorus (P) is an important process in the nutrient economy of perennial plants. Some studies in

temperate climates have demonstrated that evergreen species (often needle-leaved gymnosperms) have the phenotypic or genotypic capacity to resorb a greater proportion of N and/or P prior to litterfall than do neighboring deciduous species (generally broad-leaved angiosperms), though the angiosperms may show a greater range of resorption phenotypes. To determine if greater resorption or a narrower range of resorption phenotypes is a general gymnosperm trait, we measured nutrient concentrations, changes in specific leaf mass, and nutrient resorption in four individuals of *Gingko biloba*, including both male and female trees. Comparisons between *G. biloba* resorption behavior and those of other trees of the region will be presented.

**4:00 EVIDENCE FOR A MEDIATING ROLE OF ORGANIC AND INORGANIC IONS IN THE HIGH TEMPERATURE STRESS-INDUCED INCREASE IN THE SUSCEPTIBILITY OF MAIZE TO *BIPOLARIS MAYDIS* RACE T TOXIN. M. O. Garraway, Department of Plant Pathology, The Ohio State University, Columbus, OH 43210.**

Maize leaves that have been pre-treated with high temperature stress (HTS) show increased susceptibility to *Bipolaris maydis* race T, the southern corn leaf blight pathogen, and to its host-selective toxin (BMT-toxin), as measured by rates of ion leakage. Therefore, studies were undertaken to determine possible mechanisms involved in the response. Leaves from resistant and susceptible isolines of maize were exposed to 42C in the dark for 20 or 120 min (HTS), then infiltrated for 2 hr with a BMT-toxin solution. Rates of electrolyte leakage from these leaves were compared to rates from similar leaves infiltrated with toxin but not exposed to HTS. Both isolines had increased sensitivity to BMT-toxin when exposed to HTS but the response was significantly greater with the susceptible isoline Also, leaves of the susceptible isoline, not exposed to HTS, had comparable increases in sensitivity to those exposed to HTS, when BMT-toxin solutions were supplemented with 2 μg/ml or less of an amino acid extract from maize or $K_2HPO_4$. Since amino acids and phosphate ions are present in leaf leachates, these data indicate that leakage of metabolites from maize leaves in response to HTS may mediate the HTS-induced increase in susceptibility to *B. maydis* race T and BMT-toxin.

**4:15 SEED GERMINATION OF *CYPRIPEDIUM ACAULE* AND *CYPRIPEDIUM REGINAE* (ORCHIDACEAE) IN AXENIC CULTURE. Warren Stoutamire, Dept. of Biology, The University of Akron, Akron, OH 44325**

Seed germination in axenic culture was followed in different temperature regimes. Both species germinate poorly at 20°C without stratification. Cold treatment at 5°C greatly increases germination in both but the responses differ. The germination rate of *Cyp. reginae* seeds after 2 or more months refrigeration is high and is essentially completed by the end of the first growing season. Only 10-15% of the seeds of *Cyp. acaule* begin growth the first season after 1-4 months cold. The germination rate increases during the second 12 months and most of the embryos have germinated by the end of the second year. There would be little advantage in delayed germination in the predictably moist habitats of *Cyp. reginae* while the greater moisture variation in *Cyp. acaule* habitats may be a selective factor for the delayed germination of this species.

**4:30 DOES OZONE PRECONDITIONING AFFECT THE RESPONSE OF HARDWOODS TO OZONE? Joanne Rebbeck and Ken Loats, USDA Forest Service, 359 Main Rd, Delaware, OH 43015 and Denison University, Granville OH 43023.**

One year-old stock of black cherry *(Prunus serotina)* and yellow poplar *(Liriodendron tulipifera)* were planted in 15x30 cm PVC pots containing a 1:1:1 soil:peat:perlite mix and grown from May through October 1990 in two growth environments: (1) Open-top chambers (OTC) with either two times ambient ozone concentration (2X) with a seasonal cumulative ozone dose[COD = 98 ppm.hrs) or charcoal-filtered air (CF)[COD = 16 ppm.hrs]; and (2) Greenhouse (GH) with charcoal-filtered air. All yellow poplar stock were transplanted into 20x30 cm pots in April 1991. In May 1991, both OTC and GH stock were grown in OTC and exposed to either 2X ambient ozone (COD = 197 ppm.hrs) or CF-air (COD = 31 ppm.hrs) for 17 weeks. Midday measurements of net photosynthesis (NPS) and stomatal conductance (SC) were made on two leaves (recently mature or old) on each plant of both species in July and August 1991. Measurements of growth were made periodically throughout the study. Neither 1991 ozone treatments nor prior environment had a significant effect on either NPS or SC of black cherry. Yellow poplar did show significant differences in NPS and SC due to prior environment and 1991 ozone exposure. Decreases in NPS were observed for yellow poplar exposed to 2X ambient ozone for two years compared with those grown in CF-air. However, those yellow poplar exposed to 2X ambient ozone in 1991 only showed increases in NPS and SC compared with CF-air grown plants.

## B. Plant Sciences
## Second Afternoon
## 2:00 pm, Saturday, May 2, 1992
## College of Business Administration 131
## Juliana Mulroy, Presiding

**2:00 ENVIRONMENTAL FACTORS RESPONSIBLE FOR THE DECLINE OF SELECTIVE SAVANNA HERBS AND OAK SEEDLINGS AS OAK SAVANNA SUCCEEDS TO FOREST. Lawrence G. Brewer and John L. Vankat. Miami University, Oxford, OH 45056.**

During presettlement time Oak Savanna was a dominant plant community in the Midwest. However, today due to agriculture and lack of fire it is considered by the Nature Conservancy to be the rarest plant community in the area. Experimental plot manipulation studies were conducted to determine the causes for the decline of four savanna herbs and two oak trees as oak savanna is converted to forest. Seeds of *Lupinus perennis* (wild lupine), *Tephrosia virginiana* (goat's rue), *Baptisia tinctoria* (wild indigo), and *Andropogon scoparius* (little bluestem), and seedlings of *Quercus velutina* (black oak) and *Quercus alba* (white oak), were planted in field plots with different amounts of light (different tree densities), litter ($O_1$ & $O_2$), and fire. Preliminary data indicate that competition from fine roots in the $O_2$ layer from invading trees, especially *Acer rubrum* (red maple), had the most influence on limiting plants, followed by lack of nutrients from the absence of burning, absence or excess of solar radiation, and leaf litter. The study showed that, at least in the short run, certain savanna herbs do best in areas with relatively dense canopy (canopy species cover + subcanopy species cover = 100%), as long as the surface layer is burned regularly.

**2:30 ANALYSIS OF LATE HOLOCENE WOOD AND LAND SURVEY RECORDS FROM THE FOUR MILE CREEK/EAST OXFORD, OHIO AREA. Donald E. Trisel and Will H. Blackwell, Department of Botany, Biological Sciences Building, Miami University, Oxford, OH 45056.**

To better understand the paleofloristic history of southwest Ohio, fossil wood was studied from the recently excavated site of the new Oxford Water Treatment Plant (WTP). Three age categories of mummified wood from the WTP have been identified using radiocarbon dating: -5450 years B.P., - 950 years B.P., and -495 years B.P. These categories of radiocarbon dates correlate with periods of Holocene fluvial activity as described by Knox et al. (1981). Among the wood samples collected, the following identifications have been made based on microscopic wood anatomy: *Acer* sp. (hard maple), *Catalpa speciosa, Platanus occidentalis, Quercus sp.* (probably *Q. lyrata), Quercus rubra* and *Ulmus americana*. The taxa identified are characteristic of the transition from upland to floodplain forests of the present day, with the exception of *Quercus lyrata*(?), which may be a relict from the Xerothermic period. Analysis of the original land survey records indicates that Gordon's (1966) mapping of original vegetation of four local townships did not account for all vegetation types. Floodplain forests have been recognized in my study; these were not identified by Gordon. We could not document Gordon's representation of elm-ash swamp forests, and boundaries of other forest types previously mapped are subject to question. This study shows that the wood samples were probably deposited by solifluction in a transition area between an upland oak-sugar maple forest and the floodplain forest of Four Mile Creek.

**2:45 EVOLUTION IN BARNADESIINAE (COMPOSITAE). Tod F. Stuessy. Department of Plant Biology, The Ohio State University, 1735 Neil Avenue, Columbus, OH 43210.**

Recent cpDNA studies have suggested Barnadesiinae as the primitive subtribe of Compositae. This is a group of eight shrubby genera with about 90 species restricted to southern and Andean South America. The largest genera, making up 91% of species in the subtribe are *Barnadesia, Chuquiraga* and *Dasyphyllum*. Morphologically, *Barnadesia* is unusual in having zygomorphic corollas with four fused lobes on one side and one separate filiform lobe on the other. *Chuquiraga* and *Dasyphyllum* have regular corollas with five (or occasionally four) lobes. This latter condition is regarded as primitive in the subtribe and for the family as a whole. The corolla morphology in *Barnadesia* seems best regarded as a derived

adaptation for hummingbird pollination. Known chromosome numbers for the subtribe include $n = 8$, 24, 25, 27, 31 and 54. The monotypic *Schlechtendalia,* related to *Dasyphyllum,* has the lowest haploid number of $n = 8$, which suggests a base of $x = 8$ for the group with an $x = 9$ line apparently leading to *Chuquiraga.*

**3:00 A NEW SPECIES OF *CALYCERA* FROM NORTHERN ARGENTINA. Melanie L. DeVore, Department of Plant Biology, The Ohio State University, 1735 Neil Avenue, Columbus, Ohio, 43210**

The genus *Calycera* is represented in high Andean habitats by two groups of perennials. One group, which includes *C. herbaceae,* consists of erect, herbaceous, perennials inhabiting the Main Range of Argentina and Chile. The second group consists of rosette perennials found in the Domeyko Cordillera, Frontal Cordillera, and the Puna. In the past, all members of the second group were recognized as *C. pulvinata* Remy. Hicken (1919) treated *C. pulvinata* and described two formae *(pulvinata* and *cauligera)* based on the degree of stem branching and growth form. After examining specimens housed at Museo de Ciencias Naturales de La Plata, it appears that the specimens Hicken studied (all from Argentina) are not the same species as *C. pulvinata* Remy. Recent monographic work shows that *C. pulvinata* Remy is most similar to *C. sessiliflora* in Chile, while the new species is most similar to the complex of species which includes *C. herbaceae.*

**3:15 CLASSICAL TAXONOMIC PROBLEMS ENCOUNTERED DURING THE REVISION OF THE GENUS *MULINUM* PERS. (APIACEAE). James C. Zech. The Ohio State University, Department of Plant Biology, 1735 Neil Avenue, Columbus, OH 43210-1293**

Classical taxonomy refers to the study of individuals rather than populations and considers the nonevolutionary aspects of systematics, including subjects such as priority and nomenclature. During the revision of the genus *Mulinum,* several classical taxonomic problems were encountered. Within the genus over 40 names have been published. Of these 40, approximate1y 11 represent the genus. Philippi published 3 versions of the "Florula Atacamensis" during 1860, creating a question of priority for *Mulinum crassifolium* Phil. *Mulinum albovaginatum* Gillies & Hook., *M. pauciflorum* Reiche, and *M. famatinense* H. Wolff. were described as 3 separate species by various authors but represent a single species. In addition, problems of single species described as 2 within respective separate countries, excluded names, and names which have never been described or published for the genus will be discussed.

**3:30 A STUDY OF WILDFLOWERS OF THE BLACKLICK METROPOLITAN PARK SUCCESSION AREAS AT REYNOLDSBURG, OHIO. Terrill J. Long, Biology Department, Capital University, Columbus, Ohio, 43209, and Leslie A. Rawlings, Naturalist, Blacklick Metropolitan Park, Reynoldsburg, OH 43068**

The phenology and location of wildflowers in the succession areas at Blacklick Metropolitan Park were determined. Flowering dates were determined once weekly by recording the first appearance of flowering in each species. This was accomplished by walking the major trails and service trails once weekly. Dated maps were prepared showing abundance and location of the wildflowers.

Many of the species are normal to succession areas in Central Ohio. Although no endangered or rare species were found, several prairie species such as Prairie Blazing Star *(Liatris picnostachya)* were found. Their accidental planting and longevity will be discussed. Wildflowers of European origin will also be designated. Succession areas are managed by mowing every two or three years to keep the areas in early stages of succession.

**3:45 FIRST RECORD OF *LEERSIA LENTICULARIS* (POACEAE) IN OHIO AND THE GREAT LAKES DRAINAGE James S. McCormac, Division of Natural Areas & Preserves, Ohio Dept. of Natural Resources, 1889 Fountain Square, Columbus, OH 43224**

*Leersia lenticularis* Michx., Catchfly Grass (Poaceae) is a large, scabrous wetland plant occurring in seasonally saturated soils of floodplains and swamps. The only representative of the genus *Leersia* endemic to the United States, *L. lenticularis* is confined to the Atlantic and Gulf coastal plains, and ranges inland along major river systems. It penetrates furthest north along the Mississippi River and its tributaries, extending to Minnesota and Wisconsin, and east to Indiana and Kentucky. Field investigations of the St. Mary's River in extreme west-central Ohio in 1991 documented populations of *L. lenticularis* from the Ohio counties of Auglaize, Mercer, and Van Wert. These populations occur in oxbows isolated from the main river channel except during high water periods, when flood waters temporarily inundate these areas. The St. Mary's River is a tributary of the Maumee River, a major watercourse of the Lake Erie drainage. Two possible avenues allowing plant migration from the Mississippi drainage to the Lake Erie drainage include the Maumee Terrace near Fort Wayne, Indiana and the historic wet prairie now covered by present day Grand Lake St. Mary's, near Celina, Ohio. These two locations separated the Wabash and St. Mary's river systems.

**4:00 THE GENUS *CAREX* AND OTHER SEDGES IN OHIO FENS. Gregory J. Schneider. Environmental Science Program. Ohio State Univ., Columbus, OH 43201.**

Sedges represent one of the principle components of the flora of alkaline fens in Ohio. For the purpose of compiling a comprehensive list of the locations of all sedges important to the flora of Ohio fens, herbarium specimens were checked at The Ohio State University, The Cleveland Museum of Natural History, and Kent State University. The Ohio Natural Heritage Data Base was consulted for species considered endangered or threatened. Field surveys were conducted at the majority of the known fens in Ohio during 1990 and 1991. Twenty-seven fens, mostly from north eastern and west-central Ohio were chosen for this study. Based on the occurrence of species in fens and/or their confinement to highly calcareous habitats in and out of Ohio, twenty-two species of *Carex,* as well as nine other species of sedge were chosen as characteristic of Ohio fens. Maps were prepared for each species showing distributions in Ohio and throughout North America. Results show important differences between the sedge flora of the fens of western Ohio with their prairie affinity and the fens of northeastern Ohio, which have boreal affinity.

**4:15 THE TAXONOMY OF *PEDICULARIS* (SCROPHULARIACEAE), Lazarus Walter Macior, Department of Biology, University of Akron, Akron, OH 44325-3908.**

The genus *Pedicularis,* with about 800 species distributed over the northern hemisphere mostly in arctic and montanealpine regions, has been characterized taxonomically over the past 240 years by diverse taxonomists familiar with diverse regional floras and using diverse systematic criteria for distinguishing species interrelationships. The need for a comprehensive, definitive taxonomy of *Pedicularis* is currently being addressed. The Linnaean taxonomy of the genus included 14 species classified solely on stem branching. Phyllotaxy, leaf form, plant-growth form, inflorescence type, calyx morphology, corolla form including dentition and elongation of the galea and extension of the corolla tube, and corolla color are taxonomic criteria added by Steven, Bentham, Bunge and Bonati in the period 1823-1910. The significance of species distributions and putative migration patterns of *Pedicularis* in taxonomic systems were emphasized by Maximowicz, Prain, and Limpricht at the turn of the century. Based upon 431 species, the first phylogenetic tree of *Pedicularis* was proposed by Limpricht in 1924. A consideration of floral function and evolution in relation to taxonomy by Li has been followed more recently by a detailed analysis of pollen morphology in relation to *Pedicularis* taxonomy by Tsoong and Chang. Problems in establishing a comprehensive taxonomy include assessment of the roles of convergent and reticulate evolution in natural selection.

**4:30 A PANIC GRASS NEW TO THE FLORA OF OHIO: *PANICUM COMMONSIANUM* ASHE VAR. *EUCHLAMYDEUM* (SHINNERS) POHL. James K. Bissell. The Cleveland Museum of Natural History, 1 Wade Oval Drive, University Circle, Cleveland, OH 44106.**

*Panicum commonsianum* var. *euchlamydeum,* a panic grass never before reported to the flora of Ohio, was discovered within an open sand barren at the Toledo Express Airport in Lucas County on June 8, 1990. The typical variety occurs on the Coastal Plain from MA to FL and is represented inland by var. *euchlamydeum* that occurs on sand barrens, dunes and dry open woods from Presque Isle Peninsula in northwestern PA west to northern IL, WI and eastern MN. Based upon the superficial resemblance of *Panicum commonsianum* and *P. villosissimum,* all OSU holdings of the latter were borrowed and all were determined to be other species. Eight sheets from three counties: Ashtabula, Cuyahoga and Erie were *P. commonsianum* var. *euchlamydeum.* Collection dates ranged from 1898 to 1932. Six of them were collected from Cedar Point Peninsula between 1898 and 1911. The Ashtabula County specimen from East Conneaut Beach was dated 1932 and the Cuyahoga County plant was collected from sandy openings near Wade Park in 1902.

**4:45 POPULATION CHANGES IN A STAND OF BRADLEY'S SPLEENWORT (*ASPLENIUM BRADLEYI* D.C. Eaton) DURING A FIVE YEAR PERIOD. Marilyn Ortt, ODNR Division of Natural Areas & Preserves, 701 Colegate Dr., Marietta, OH 45750.**

*Asplenium bradleyi* is a srnall evergreen member of the Aspleniaceae. This species, listed as Threatened by the State of Ohio, grows in crevices in sandstone outcrops and most records are found in severe sites in full sun. Five populations are presently extant in Washington County. The Little Natural Bridge population has been monitored over the past five years. During this period the total number of apparently live plants dropped 35% in 1988 and has increased very slowly since then. However, the percentage of fertile plants showed a marked decrease from 76% of the total plants in 1987 to 28% in 1990. Variations in survival of small groups in differing microhabitats will be presented.

## B. Plant Sciences
## Poster Session
## Saturday, May 2, 1992
## College of Business Administration Concourse

**BOARD I**

**9:00 NITROGEN ASSIMILATION DURING TRACHEARY ELEMENT DIFFERENTIATION IN LETTUCE *(LACTUCA SATIVA)* PITH EXPLANTS. Amy Clark, Douglas Demian, Ann Salvino, Frank Wroblesky, and Prudence Hall, Biology Department, Hiram College, Hiram, OH 44234**

Activities of nitrogen assimilatory enzymes, nitrate reductase (NR) and glutamine synthetase (GS), were determined in lettuce *(Lactuca sativa)* pith parenchyma explants during tracheary element (TE) differentiation. TEs were detected after 4 to 5 days in explants cultured on Murashige and Skoog medium containing 0.03 mM indoleacetic acid and 4.7 uM zeatin, and the number increased with time of culture. At 14 days the fresh weight of treated explants was nearly twice that of untreated controls, while protein content was 2 to 4 times that of controls. Both $NH_4^+$ and $NO_3^-$ are in the medium. NR is an inducible enzyme, but since its induction is repressed in the presence of reduced nitrogen, we reasoned NR activity would be slight as compared to GS. At 14 days only slight NR activity in any explant was detected. The specific activity of GS as measured by the glutamyl- $\alpha$ - hydroxamate transferase assay averaged 177 nmoles/hr/ug protein in controls but only 75 nmoles/hr/ug in treated explants. Specific activity of GS increased between 7 and 14 days in both sets.

**BOARD J**

**9:00 A COMPARISON OF FIVE DRYING TECHNIQUES FOR SCANNING ELECTRON MICROSCOPY USING *ARABIDOPSIS THALIANA*. Heather Kunz and Connie Bricker, Department of Botany, Miami University, Oxford, OH 45056**

Five different techniques for drying samples for use in scanning electron microscopy were investigated: critical point drying (CPD), hexamethyldisilizane (HMDS), tetramethylsilane (TMS), PELDRI II, and air drying. *Arabidopsis thaliana* seeds were refrigerated for two days and then placed under a grow light for 14-18 days, until they flowered. The flowers were then removed from the plant and fixed in 3% glutaraldehyde for two hours and then post-fixed in 1% osmium tetroxide for two hours. The samples were dehydrated through a series of graded ethanols. The results for each technique were analyzed for pollen retention in the anthers and for cell collapse. The standard for comparison for the techniques was critical point drying. The critical point dried samples showed little or no cell collapse; however, the pollen retention was poor in some samples. Flowers dried in HMDS showed much cell collapse, but very good pollen retention. Flowers treated with TMS had high pollen retention and some cell collapse, but the collapse was random and not widespread. PELDRI II gave results similar to CPD but pollen retention was higher. PELDRI II could prove to be an excellent alternative drying technique to critical point drying. The air dried flowers showed large amounts of collapse, but the pollen retention was extremely high.

## C. Geology
## First Morning
## 9:00 am, Saturday, May 2, 1992
## College of Business Administration 147
## Mac Swinford, Presiding

**9:00 THE PALEOGEOGRAPHY OF THE UPPER DEVONIAN SHALES IN THE EUCLID CREEK GORGE, CLEVELAND, OHIO. Theodore M. Shaw, 89 E. Brookside Ave., Akron, OH 44301.**

The Chagrin Shale is found at the bottom of the gorge and consists of silty clayshales and laminated siltstones interbedded with fine to very fine grained sandstones. The sandstones coarsen upwards. Siderite concretions are present at several levels within the unit. Oscillation ripples and erosional bases distinguish the bedded sandstones as storm deposits, not turbidites. Paleocurrent data from the ripple marks and bedding planes of the shale indicate flow to the south and southwest. The Chagrin Shale is interpreted as shelf deposits below the fair weather base. Above the Chagrin Shale, the Cleveland Shale consists of siliceous siltstones with interbedded clayshales and thinly bedded sandstones. The sandstones are medium grained, coarsen upwards, and exhibit hummocky crossbedding, oscillation ripples, and erosional bases. Paleocurrent data shows similar results to the Chagrin Shale and a similar interpretation is proposed. Above the Cleveland Shale, the Euclid Creek Sandstone consists of medium to thick bedded sandstones and interbedded siltstones. The sandstone is fine grained and exhibits ball and pillow structures. The presence of the Bedford/Berea (Mississippian) deltaic sequence above the Euclid Creek Sandstone suggests a pro-delta or delta front sandbody.

**9:15 THE YOUGHIOGHENY RIVER GORGE AT OHIOPYLE, PENNSYLVANIA CONTAINS THE MOST EXTENSIVE EXPOSURE OF UPPER DEVONIAN (VENANGO GROUP) SEDIMENTS IN SOUTHWESTERN PENNSYLVANIA. Kenneth A. LaSota, Robert Morris College, Department of Quantitative and Natural Sciences, Pittsburgh, PA 15219-3099**

Venango Group (Upper Devonian) sediments were the reservoir rocks for Colonel Edwin L. Drake's first oil well in 1859. In most of the Appalachian Plateau region of southwestern Pennsylvania, the Venango Group is present only in the subsurface. Notable exceptions are the Youghiogheny and Conemaugh River gorges through Laurel Hill and Chestnut Ridge. The Youghiogheny River Gorge of Laurel Hill contains the most extensive sequence of Upper Devonian deposits in southwestern Pennsylvania. Present are approximately 200 meters of terrestrial and near shore marine deposits of the Upper Devonian Catskill Delta Complex. These include: upper delta plain deposits of red shale and sandstone which record classic "Catskill" sedimentation, lower delta plain deposits of brown and gray shale and sandstone interbedded with marine fossils, and near shore marine deposits, which include a barrier bar deposit. These sediments record a transgressive marine event within the Fulton Lobe of the Catskill Delta Complex of southwestern Pennsylvania. These outcrops (five km east of Ohiopyle, Pennsylvania) are readily accessible via the Ohiopyle State Park bike trail along the south bank of the Youghiogheny River and the Conrail railroad tracks along the north bank.

**9:30 PETROGRAPHY OF THE PENNSYLVANIAN SHARON SANDSTONE, SUMMIT COUNTY, OHIO. Theodore M. Shaw and Charles H. Carter, Department of Geology, University of Akron, Akron, OH 44325.**

Thin section studies of these fine to medium grained, well-sorted sandstones show that the framework grains consist of 55 to 75 percent monocrystalline quartz, 5 to 15 percent lithic fragments, and 2 percent or less feldspar. The cement consists of quartz overgrowths, which are most common on the smallest grains, and/or iron oxides. The quartz is largely strained, is subangular to well rounded, and contains a variety of inclusions. The lithic fragments, which are generally deformed, consist largely of polycrystalline quartz, chert, schist/phyllite, and siltstone/mudstone. The sandstones can be grouped into 2 populations, one with about 5 percent lithic fragments, and the other with about 15 percent lithic fragments. Surprisingly, the coarsest sandstones contain the lowest percentages of lithic fragments. The strained and polycrystalline quartz and the

schist/phyllite indicate metamorphic source rocks and the chert and well rounded quartz indicate sedimentary source rocks, probably from a foreland thrust belt and an interior craton. The paucity of feldspar coupled with the likelihood of feldspar-bearing source rocks implies a warm, humid climate and decomposition of the feldspars. The differences in the framework mineralogy indicate at least two source areas and/or differences related to processes or time.

**10:00 NEW 1:24,000-SCALE BEDROCK GEOLOGY AND BEDROCK TOPOGRAPHY MAPS FOR CENTRAL-WESTERN OHIO.**
**E. M. Swinford, G. E. Larsen, G. A. Schumacher, D. L. Shrake, and E. R. Slucher, Ohio Department of Natural Resources, Division of Geological Survey, 4383 Fountain Square Drive, Columbus, OH 43224.**

The Ohio Department of Natural Resources, Division of Geological Survey, in cooperation with the U.S. Geological Survey COGEOMAP Program, is updating the bedrock geologic map of Ohio through reconnaissance mapping. Mapping began in a 22-county area in central-western Ohio that includes the Piqua, Marion, Lima, and Bellefontaine 1:100,000-scale topographic maps. A geologic information database was compiled and RADIAN mapping software was used to produce 1:250,000-scale structure maps from which 1:24,000-scale structure maps were derived. Nine core holes were drilled by the Survey to document and help correlate the lithostratigraphy of the mapped units. Bedrock topography maps (1:24,000 scale) also were produced for the entire study area. Mapped rock units are Ordovician, Silurian, and Devonian in age and include Ordovician undifferentiated, sub-Lockport undifferentiated, Lockport formation, Greenfield Dolomite, Tymochtee Dolomite, Salina undifferentiated, Columbus Limestone, Delaware Limestone, Olentangy Shale, and Ohio Shale. A total of 126 open-file bedrock geologic and bedrock topographic quadrangle maps have been produced and are on file at the Ohio Geological Survey.

**10:15 BASEMENT-INVOLVED DEFORMATION, SEMINOE MOUNTAINS, WYOMING. DOMINIC, J.B., and MCCONNELL, D.A., Department of Geology, U. of Akron, Akron, OH 44325.**

The Seminoe Mountains, south-central Wyoming, represent part of the southern flank of the Granite Mountains uplift that was thrust over the northern margin of the Hanna basin. Basement and sedimentary rocks exposed in the Seminoe Mountains were examined in an effort to determine the geometry of the uplift bounding faults.
The eastern Seminoe Mountains contain two plunging basement-involved folds. Downplunge projections and balanced cross sections were used to constrain interpretations of fold style. A major detachment surface was identified in the Permian Goose Egg formation. A basement-involved fault with approximately 3 km separation changes orientation upsection and is layer-parallel in the detachment horizon. The sedimentary section can be divided into a lower structural lithic unit of low ductility Cambrian-Pennsylvanian rocks in which shortening occurred on the basement fault, and an upper unit of moderate ductility Permian-Cretaceous rocks that was shortened by thin-skinned thrusts that detached in the Goose Egg formation.

**10:30 A "ROCK CITY" IN RICHLAND COUNTY, OHIO—AN INDICATION OF POSSIBLE PERIGLACIAL ENVIRONMENT.**
**C. Scott Brockman, Ohio Division of Geological Survey, 4383 Fountain Square Dr., Columbus, OH 43224.**

A geological feature in southeastern Richland County, Ohio, matches descriptions of "rock cities" reported in the Appalachian Mountains, where they have been associated with other periglacial features. This report is believed to be the first application of the term to a feature in Ohio. The rock city is mid-slope on a north-facing, 20% slope on Butternut Nature Trail at Malabar Farm State Park at an elevation of 1150 feet. It consists of a series of interconnected passageways or joints, 3-6 feet wide, 20-25 feet deep, and about 100 feet long, with vertical walls that open to the surface. The joints disconnect a massive, horizontal block of Black Hand sandstone which rests on the nearly horizontal bedding plane of rock below. The block does not appear to have been involved in downslope movement, although, in the general area, dipping and overturned blocks of similar dimensions are common on slopes and appear to be a result of mass movement. Upslope are several closed depressions, 10-30 feet in diameter, 1-2 feet deep, and usually wet. These depressions may be soil-covered pseudo-karst features that overlie widened joints similar to those exposed downslope in the rock city. The feature is 1.5 miles behind the maximum Late Wisconsinan glacial margin. Rock cities by themselves suggest but do not prove a former periglacial environment; likewise, to date in Ohio other evidence of periglacial environments is also only suggestive and includes several localities of soil involutions in buried paleosols near New Paris, Sidney and Newark. A possible mechanism for the formation of rock cities is expansion of ice wedges in joints in a periglacial environment.

## C. Geology
## Second Morning
## 9:00 am, Saturday, May 2, 1992
## College of Business Administration 146
## Howard Lo, Presiding

**9:00 THE LUNAR CAPTURE MODEL AND THE PREDICTED TIDAL REGIME OF THE ARCHEAN. Robert J. Malcuit and Ronald R. Winters, Denison University, Granville, OH 43023**

In recent work we demonstrated, by way of numerical three-body simulations, that intact gravitational capture is physically possible for a lunar-like body encountering an earth-like planet. Here we present equilibrium tidal amplitude information that is calculated directly from the numerical orbital data. For ocean tidal amplitudes we use a displacement Love number (h) of 1.0 and for rock tidal amplitudes a value of 0.7. We date the capture event (episode) at about 3.9 billion years before present. The early post-capture tidal regime of the planet is characterized by short periods of high (perigean) tidal amplitudes interspersed with long periods of very low tidal amplitudes. Typical values for perigean ocean tidal amplitudes for the first three years (16 orbits) of a typical stable capture scenario vary from 26.8 km for the initial close encounter at 1.43 $R_e$ (earth radii) to 1.9 m for a perigee distance of 34.4 $R_e$. Corresponding rock tidal amplitudes are 0.7 of the ocean tide values. Numerical simulation of the post-capture orbit circularization of a two-body system suggests a time-scale of about 1.0-1.5 billion years for circularization to about 10% eccentricity. This model of tidal activity is uniquely associated with a tidal capture scenario and appears to be testable by detailed examination of Archeanage tidal zone deposits.

**9:15 GLOBAL CHANGE AND THE HUMAN BOLIDE. G.D. McKenzie, Geological Sciences, The Ohio State University, Columbus, OH 43210.**

Global change includes all solid-earth and climate-related geomorphic/geochemical processes (e.g., hazards) and human activities (e.g., mining, urbanization, agriculture, and deforestation). Concerns about change are that 1) it is increasingly due to human activity, 2) it threatens the global environment including the life support system of humans, 3) the margin of safety provided by migration is disappearing, and 4) the workings of the biogeosystem are poorly understood. Global models are sought to address policy for problems related to global change. Unfortunately these models and policies inadequately incorporate human population growth—one part of the biogeosystem for which we are able to make reasonable projections now. About 5.3 billion more humans are expected in 40 years. If this mass of humanity were a bolide of close-packed humans, its diameter (D) would be 1 km. A 22-km D food energy bolide would accompany the human bolide; its impact would produce a major extinction event. An International Decade of Population Stabilization is needed to address this environmental hazard which is potentially the most important factor in global change.

**9:45 SOIL/SAWDUST MIXTURE AS ADSORBENT FOR TREATMENT OF WASTEWATER. Howard H. Lo and John T. Redmon, Department of Geological Sciences, and Yung-Tse Hung, Department of Civil Engineering, Cleveland State University, Cleveland, OH 44115.**

The objectives of this laboratory study were to determine the effectiveness of the soil/sawdust mixture as an adsorbent in removing turbidity, total organic carbon (TOC), and phenol from wastewaters. Parameters in the investigation include strength of wastewater, dosage of adsorbent, dosage of phenol addition, and dosage of living liquid microorganism (LLMO) addition. The performance of powdered activated carbon (PAC) and granular activated carbon (GAC) as adsorbents in wastewater treatment was also investigated in this study. Primary effluents were obtained from Solon Water Pollution Control Plant, Solon, Ohio. Dosages of adsorbents used were 0.5, 1.0, 2.0, 3.0, and 5.0 g/l. A mixture of 1:1 weight ratio of soil (a silty clay loam) and red oak sawdust were used in the experiment. Results showed that the soil/sawdust mixture appeared to be ineffective in removing turbidity, TOC, and phenol from wastewaters, regardless of the strength of the wastewater and even with addition of the LLMO. On the other hand, the

PAC and GAC were effective in removing phenol, turbidity, and TOC from wastewaters. The removal efficiencies for a full strength wastewater without LLMO addition at 1.0 g/l PAC dosage were 76% turbidity and 43% TOC. The corresponding removal efficiencies were 86% turbidity and 50% TOC with LLMO addition.

**10:00 FACTORS THAT CAN INITATE MINE SUBSIDENCE OR DAMAGE FOUNDATIONS OF BUILDINGS. Harris, Ann G., Department of Geology, Youngstown State University, 410 Wick Avenue, Youngstown, OH 44555**

Whenever subsidence of the ground occurs in Northeastern Ohio the immediate thought is that the property is undermined by abandoned deep mines, usually coal mines. Even if abandoned deep mines are in the vicinity they may not be the problem. Subsidence can be triggered by other factors. The main culprit is usually the type of soil. Examples are building on silts that have a high water table such as in a flood plain area or overloading clay soils. There have also been situations where homes have unknowingly been built on quicksand. Broken or shifting water or sewer lines can cause lawns to sink. Tree stumps that have been buried for years, in particular, ones by contractors in a pit, will produce subsidence pits. Housing developments built on the site of former farms may have homes built over the wells, cisterns, building foundations or filled in ravines and/or ponds. Damage to foundations can be produced by such factors as downspouting which has been improperly hooked up or has separated below the surface. Sometimes expanding slags have been used for foundations. Soils that have not been compacted properly, especially strip mine spoils. Poor construction or home additions that have not been tied into the building.

**10:15 ALLEN COUNTY AREA COMBINED AQUIFER SYSTEM SOLE SOURCE AQUIFER PROPOSED DESIGNATION, Julie Weatherington-Rice, B & W, 2700 E. Dublin-Granville Rd., Cols, OH 43231.**

In 1986 a regional landfill was proposed at Spencerville, over the NW Ohio carbonate aquifer. Local officials challenged suitability of the site and organized a comprehensive site evaluation. Monitoring well water levels on the proposed site revealed site was within daily pumping cone of the village well field, and therefore, extremely unsuitable as landfill site. This case focused ground water protection efforts across Ohio. Ohio EPA credits this case and Sherman-Williams fire in Dayton as the two most graphic examples for wellhead protection in Ohio. They use these experiences to encourage other Ohio communities to develop regional or local ground water protection plans and to encourage passage of Ohio Safe Drinking Water legislation. This experience was also a driving force behind the passage of H.B. 592. Local officials, recognizing that Ohio still has no legal mechanism for protection of critical aquifers, petitioned US EPA to designate the area a Federal Sole Source Aquifer. Information gathered in the petition effort was used for the Allen Co. DRASTIC map. US EPA has given preliminary approval with final approval expected in April, 1992.

## C. Geology
## Only Afternoon & Business Meeting
## 1:30 pm, Saturday, May 2, 1992
## College of Business Administration 147
## Scott Brockman, Presiding

**2:00 SLOPES, SOILS, AND ARTIFACTS: A PEDOGEOMORPHOLOGIC INTERPRETATION OF HUMAN IMPACT AT THE MUNSON SPRINGS SITE, LICKING COUNTY. Tod A. Frolking. Dept. of Geology and Geography, Denison University. Granville, OH 43023**

The Munson Springs site lies on a well-drained footslope in a south-facing amphitheater-shaped hollow in the lower Raccoon Creek Valley due west of Newark, Ohio. In this area, numerous springs issuing from the upper Raccoon shale along footslopes provide ideal environments for prehistoric encampments. Detailed archaeological study of a low oval rise (Locus A, 33-Li-251) revealed a weakly stratified series of occupations ranging from Paleoindian to Woodland age. Geomorphic and soil mapping of the hollow was undertaken to delineate natural features and to assess the degree of human modification of the area. The site lies on a dissected late-glacial colluvial apron in which the abundance of clasts decreases markedly downslope. On the footslope surface, artifacts are concentrated at a depth of 10 to 20 cm suggesting post-occupation burial by colluvial sediments. Slope form and the distribution of slope materials, however, indicate slope stability since the late glacial. Soil horizonation and the profile distribution of illuvial clay indicate minimal late-Holocene sediment accumulation. The vertical distribution of artifacts may result from soil bioturbation by soil fauna. This interpretation brings into question the validity of near surface stratigraphic interpretations of human artifacts.

**2:15 SEDIMENTATION IN A TEAYS-AGE VALLEY, GUERNSEY COUNTY, OHIO C. Scott Brockman, Ohio Division of Geological Survey, 4383 Fountain Square Dr., Columbus, OH 43224**

The Ohio Division of Geological Survey augered five continuous cores through fluvial/lacustrine materials across Leatherwood Creek valley, a former Teays-age tributary dammed during the Pleistocene. Twenty to 50 feet of sediments cover foot slopes and the bedrock valley bottom along the transect. Terrace remnants suggest a maximum elevation of lacustrine deposits of 900-930 feet; above that elevation is loess over red-shale- and clay-rich colluvium. Loess, 3 feet thick, topped all cores but one in the floodplain. In four cores, weathered colluvium overlies bedrock of the red-shale-rich Conemaugh Group. The lowermost waterlain unit in all cores is sand (fluvial/deltaic) overlain in the center of the valley by silt/clay rhythmites and along foot slopes by massive silt or interlayered silt and sand which fine upward (lacustrine). All cores record at least one lake event. In the core from the center of the valley, the upper contact of the lacustrine unit is sharp and erosional, overlain by a second sequence of sand (fluvial) that fines upward to silt (lacustrine). This sand/silt unit may represent erosion and stream deposition followed by a second, less extensive lake in which deposits potentially reach an elevation of about 840 feet. Deposits of the second lake are covered by recent alluvium. Some sands on the foot slopes contain a significant percentage of lithic clasts similar to those in the colluvium. Colluvial contributions to local deltas and subsequently into the deeper lake in the form or rhythmite-depositing flows may record significant, widespread slope instability.

**2:30 A GEOLOGIC, HYDROGEOLOGIC AND SOILS SURVEY AS IT RELATES TO LAND USE DEVELOPMENT IN GERMAN TOWNSHIP, MONTGOMERY CO., OH., Racine, Marc & Julie Weatherington-Rice, B & W, Inc, 2700 E. Dublin-Granville Rd, Cols., OH. 43231, Peter Lurker & Stephen Dourson, GACCA, 6900 Stiver Rd, Germantown, OH 45327**

In 1990, Mont. Co. SWD constructed a GIS screen to site a new landfill. The GIS screen used some outdated data, left out layers, weakening public acceptance of study. 3 sites were in German Twp. German Twp. citizens updated the geologic-hydrogeologic data base for their area. With guidance, they located well logs, measured water levels, mapped rock/till interfaces and rock outcrops, ponds, springs and seeps and screened for wetlands delineation. New data was combined with existing data to create a series of maps. These maps include top of rock, potentiometric surface, total drift isopach, s & g in drift isopach, top of s/g or rock elevation and hydric soils. Analysis shows regional ground water recharge to uplands is mirrored by apparent hydric soils pattern. Site development in German Twp. will have impact on local recharge. Drift in the Camden End Moraine contains higher % of s & g, making construction and monitoring of landfills harder. Data was not in county screen. Future local land use decisions will be based on new information.

**2:45 THE OXIDATION OF MAGNETITE IN WISCONSINAN TILL, UNION COUNTY, OHIO. Matthew C. Place and Gunter Faure, Department of Geological Sciences, The Ohio State University, Columbus, OH, 43210**

The concentrations of magnetite grains in the heavy-mineral fractions of Late Wisconsinan till samples, taken from a 1-meter pit in Dover Township of Union County, vary irregularly with depth from 3.5 to 6.9%. However, the abundance of magnetite in the 63 to 250 μm fractions of till increases systematically with depth from 45% of the magnetite in near-surface till to 68% at a depth of one meter. The abundance of magnetite in the 250 to 1000 μm fractions decreases with depth in complementary fashion from 56% at the surface to 32% at the bottom of the pit. The shift in the grain-size distribution of magnetite grains coincides with leaching of calcite whose concentrations increase from zero at the surface to 30% at a depth of one meter. Therefore, we attribute the change with depth of the magnetite grain-size distribution to preferential oxidation of small magnetite grains to hematite as a consequence of chemical weathering since deposition of the till about 14,000 years B.P. The preferential destruction of small magnetite grains (68-250 μm) compared to larger ones (250-1000 μm) is promoted by

the larger surface/volume ratio of the small grains and by the fact that small grains are consumed sooner than large grains at a constant rate of oxidation.

**3:00 ORIGIN OF A SHALLOW VALLEY CUT IN WISCONSINAN DRIFT WEST OF CAREY, OHIO. Jane L. Forsyth and Valerie H. Doolittle, Department of Geology, Bowling Green State University, Bowling Green, OH 43403,and RD 1, Box 423, Barveveld, NY 13304.**

A broad (1/2 km) shallow (3-4 m) valley extending westward from south of Carey, Wyandot County, Ohio, lying immediately south of Ohio route 15, caught the attention of the senior author some 20 years ago. Only the smallest of modern drains occurred in the bottom of the valley. At that time, its extreme shallowness was attributed to the presence of shallow resistant bedrock, since this channel lies only 1-2 km south of the more western of the two 15-25-m-high "limestone" (Niagaran dolomite) ridges that dominate the landscape northwest of Carey (ridges made famous by excessively high nitrate contents in local wells). A decade later, guided by data from the then-active Soil Conservation Service soils mapping being conducted in the county, the existence of several late Pleistocene ice-dammed lakes with a series of different outlets was recognized and detailed study of the county by the junior author (then Valerie House) identified this channel as the temporary outlet westward of her Glacial Lake Vanlue. The extreme shallowness of the valley is now interpreted to be the result of the very flat land here and the very brief interval during which this channel would have been in use, here estimated to have been no more than 100 years.

**3:15 THE CONCEPT OF DYNAMIC EQUILIBRIUM AND GLACIO-ISOSTATIC CRUSTAL DEFORMATION. Samuel Okunade, Central State University, Wilberforce, OH 45384**

The concept of dynamic equilibrium and glacio-isostatic crustal deformation has sparked heated debate among geologists in the recent past. Davisian geomorphic cycle concept is the pivot of the debate. Davis applied his geographical cycle to those in the humid temperate regions of northeastern part of North America and later to arid and glacial landscape developments. Hack (1950) and Thornbury (1969) were leading proponents advocating the alternative to Davis concept. While Davisian humid cycle concept led to extension and challenge, it has not been replaced by any other concept or as Thornbury (1969) put it "no completely satisfactory substitute for Davis geomorphic cycle has been proposed, at least not yet." In this attempt, Hack proposed an alternative approach to landform interpretation that he called the dynamic equilibrium concept. This is considered as an open system in a steady state of balance. In pursuance of the concept of equilibrium and a way to explain the balance by nature on landscape, the theory of isostasy has become one of the basic laws of geology. The term isostasy refers to the state of hydrostatic balance which is never quite achieved. Following or together with a glaciation, there is postglacial isostatic crustal rebound. Isostatic deformation of the earth's crust by the weight of thick ice sheets is confirmed by modern studies of rates of land uplift in response to glacial unloading, and by the present depression of bedrock in central Greenland and Antarctica below sea level by the weight of their ice mass.

## C. Geology
## Poster Session
## Saturday, May 2, 1992
## College of Business Administration Concourse

**BOARD F**

**10:00 UPLIFT TO BASIN TRANSITION, NORTHWEST BIGHORN MOUNTAINS, WYOMING. BRACHT, C.J., FENN, D.G., GLOSS, A.J., LEES, T.R., DOMINIC, J.B., and McCONNELL, D.A., Department of Geology, University of Akron, Akron, OH 44325.**

We examined steeply-inclined panels of sedimentary rocks that lie in stratigraphic contact with Precambrian basement along the northwestern flank of the Bighorn uplift, northern Wyoming. Macroscopic lift-off folds that are detached within the sedimentary section are characteristic of these structures. The Paleozoic stratigraphic section is divisible into two structural lithic units; 1. a lower moderate ductility unit composed mainly of Cambrian shales; and, 2. an upper unit dominated by low ductility carbonates. Detachment surfaces define boundaries between structural lithic units in the sedimentary section. Balanced cross-sections are used to constrain structural interpretations in which the tilted basement-sedimentary contact was transported as part of a hanging wall ramp over a footwall flat. The lift-off folds were used to determine both the stratigraphic location of a layer-parallel segment of the basement fault and the magnitude of layer parallel slip on the fault.

**BOARD G**

**10:00 PHYSICAL MODELS OF BASEMENT-INVOLVED FOLDS. McCONNELL, D.A., QUICK, T.J., and DOMINIC, J.B., Department of Geology, University of Akron, Akron, OH 44325.**

Fault propagation folds are identified within the Rocky Mountains where sedimentary rocks folded over fault-bounded steps in basement. The kinematic evolution of these folds is poorly understood. We used physical models to examine how folds formed in clay layers (simulating sedimentary rocks) ahead of a rising wood (basement) fault block. The apparatus used included a central wood block lying between two outer blocks. The outer blocks were driven towards each other at a uniform rate (25 mm/hr) causing the central block to be displaced upward. The clay layer deformed in response to slip of the middle block. Markers imprinted onto the clay were used to track strains during folding. Results obtained: 1. For a given fault angle, the fault propagated upwards into the clay at a constant rate. 2. Unfaulted layers underwent thickness changes prior to being cut by the fault. 3. The magnitude of thickness changes was dependent upon the angle of the underlying fault. 4. The angle of the fault in the clay layer was the same as that of the "basement" fault separating wood blocks.

## D. Medical Sciences
## First Morning
## 9:00 am, Saturday, May 2, 1992
## College of Business Administration 143
## Jere M. Boyer, Presiding

**9:00 INTELLIGENT COMPUTER ASSISTED INSTRUCTION: TEACHING CLINICAL PROBLEM-SOLVING. Joanne Guyton-Simmons, PhD, RN, Medical College of Ohio School of Nursing, P.O. Box 10008, Toledo, OH 43699-0008**

This paper describes the development of a computer simulation designed to teach nursing students clinical problem solving. The format, called "Intelligent" Computer Assisted Instruction (ICA), is non-cued; thus the student is not provided with menus of possible choices. Instead, the student interacts with the computer by typing queries/responses in natural language. Immediate feedback is given for each student response. Students receive different responses depending on their progress through the simulation. The format simulates the real world, as students must initiate information gathering queries and management actions. Although in the experimental stage, natural language computer simulations hold promise as a means of teaching clinical problem solving. They provide standardized clinical situations, so that all students can have experience in making decisions without causing patient harm. The nature of the simulations allows students to focus on the cognitive judgments needed to make clinical decisions before they encounter the stressful, complex and changing patient environment. Students have opportunities to think before they have to act.

**9:15 PAIN MANAGEMENT DECISIONS MADE BY EXPERT CORONARY CARE AND INTENSIVE CARE NURSES. JoAnne Guyton-Simmons, PhD, RN, Medical College of Ohio School of Nursing, P. O. Box 10008, Toledo, OH 43699-0008.**

The purpose of this qualitative study was to identify and analyze the decisions made by expert critical care nurses in managing pain. Much of the research in clinical decision-making has focused on the decision-making process without consideration of the influences of case content. Elstein, et al (1978) found that the nature of the task influenced the judgment of the clinician.The sample consisted of twelve coronary care (CCU) nurses and six intensive care (ICU) nurses from one midwestern hospital, all with a minimum of two years experience, elected as experts by their peers. The experts were observed by experienced Masters level students as they provided care to patients with post-operative pain (ICU) or at risk for chest pain (CCU). Two semi-structured instruments were used as a guide for data collection and recording. Interviews were tape recorded and transcribed. Observed decisions and underlying reasoning were categorized according to each state of the nursing process.

**9:30 PRIMARY PREVENTION OF FOOT AMPUTATIONS OF RURAL ADULTS USING SEMMES-WEINSTEIN MONOFILAMENTS**
**E. Kinion, EdD., J. Campbell, PhD., & R. Walker, RN., C. 201E Mary Gladwin Hall, College of Nursing, The University of Akron, Akron, OH 44325**

Diabetes mellitus and associated neuropathy is one of the most common chronic diseases affecting older adults. Diabetes accounts for more than 35,000 amputations yearly, one half of those amputations could be prevented. Early recognition of individuals at risk for foot amputations is crucial. Semmes-Weinstein monofilaments are used to obtain objective data about the level of protective sensation in individuals' feet. Loss of protective sensation is associated with amputations. The monofilaments are differentiated as 1.0 gram, 10.0 gram and 75.0 gram. Client vision is temporarily occluded and the examiner presses the monofilaments against the skin at a 90 degree angle, at various locations on each foot.
These investigators used the Semmes-Weinstein monofilaments when completing a comprehensive foot assessment of a non-random sample of 39 elderly rural adults during a health screening and education program. Demographics will be described and preliminary findings will be reported. Implications for health caregivers will be addressed.
Funded by the American Diabetes Association, Ohio Affiliate.

**9:45 MEASUREMENT OF THE EFFECTIVENESS OF AN AIDS CURRICULUM IN HIGHER EDUCATION. Shields, G., Schondel, C., and Adams, J. 413 So. Hall, Bowling Green State University, Bowling Green, OH 43403-0284**

A questionnaire was developed to measure the factual knowledge about HIV/AIDS, attitudes concerning PWAs and HIV/AIDS issues and risk behaviors associated with HIV/AIDS transmission. The questionnaire was administered at the beginning of a semester and at the end of the semester, pre and post, to an experimental and control group. The experimental group consisted of undergraduate students enrolled in a 16 week AIDS course designed to increase factual knowledge about HIV/AIDS, alter attitudes concerning PWAs and HIV/AIDS and to modify risk behavior associated with the disease transmission. Results showed a difference in knowledge and attitudes but little or no change in behaviors. The effectiveness of the AIDS curriculum was at least partially substantiated based on the data analysis.

**10:00 THE PRESENT ROLE OF ELECTRON MICROSCOPY IN THE DIAGNOSIS OF HUMAN DISEASE. Lynn M. Hamrich and David L. Mason, Biology Department, Wittenberg University, Springfield, OH 45501**

Although electron microscopy has been employed as a research tool in the basic sciences for over thirty-five years, its application to diagnostic medicine has been limited to the last fifteen years. In the early 1980's, pathologists were evaluating numerous disease states, including: malignancies, kidney disease and viruses, by means of electron microscopy. Fine-structural features provided them with clues for resolving many difficult cases. With the advent of immunomicroscopy, the need for electron microscopy diminished significantly. However, in today's world of pathology, electron microscopy still has its place. Evaluation of selected malignancies, kidney and viral diseases still includes the use of electron microscopy.

**10:15 EXCRETION OF MONOVALENT CATIONS: Na+ AND K+ IN LEAD POISONED RATS TREATED WITH 2,3-DIMERCAPTOPROPANE-1-SULFONATE (DMPS). M.R. Lust & M. Kreimer-Birnbaum. Research Department, St. Vincent Medical Center, 2213 Cherry St., Toledo, OH 43608.**

Excessive body burden with lead is still a significant health problem. Chelating agents are available for treatment of lead poisoning, but improved drugs are needed, especially those that may be given orally. One such drug is DMPS. Rats were given 200 μg/ml lead acetate in drinking water (LP group), while controls received water. Both groups received three five-day courses of DMPS (50 μmol/kg b.w./day) and urines were collected for analysis of metals. Studies of Pb excretion following DMPS showed this agent to be promising. A study of the concomitant excretion of other metals, such as monovalent cations Na+ and K+ was undertaken. After DMPS treatment the excretion of Na+ by the LP group was higher than for controls. The peak Na+ excretions showed a lag of several days after each treatment. For K+, the two groups showed similar responses to the first treatment. However, the LP group showed somewhat higher excretion patterns than the controls for the next two treatments. After the third treatment both Na+ and K+ levels were no different than their respective pretreatment levels, thus there seems to be no metabolic threat to the animals undergoing the chelation process. Repeated low doses of DMPS may be an effective therapy for lead poisoning. (Supported in part by a grant from the F.M. Douglass Foundation.)

**10:30 A PROPOSAL TO REDUCE THE INCIDENCE OF ACUTE MYOCARDIAL INFARCTION DURING TREATMENT OF HYPERTENSION. William E. Feeman, Jr., M.D., 640 South Wintergarden Road, Bowling Green, OH 43402.**

With the single exception of the SHEP trial, no clinical trial of antihypertensive therapy has been able to achieve significant reduction in the incidence of acute myocardial infarction. Research from the Bowling Green Study indicates that myocardial infarction is, at least in younger patients, mainly a function of LDL-HDL cholesterol balance and cigarette smoking. This paper uses the BG graph to demonstrate how the appropriate use of antihypertensive medications can result in a decreased incidence of athosclerotic events in general, and myocardial infarction in particular. The BG graph utilizes the cholesterol retention fraction [(LDL-HDL)/LDL] and systolic blood presure for current, past, and never-cigarette smokers. The intermix of these factors defines the at-risk (for atherosclerotic disease) population at a single pass, as well as the population at minimum-risk. The boundary between these two populations represents the threshhold for atherosclerosis and the object of antihypertensive therapy is to take the patient from the at-risk to the minimum-risk portion of the graph, which, in the author's experience, markedly reduces the incidence of atherosclerosis in general and myocardial infarction in particular.

## D. Medical Sciences
## Second Morning
## 9:00 am, Saturday, May 2, 1992
## College of Business Administration 144
## Dan Ely, Presiding

**9:00 THE INFLUENCE OF THE ANDROGEN RECEPTOR, GENDER AND THE Y CHROMOSOME ON BLOOD PRESSURE IN A NEW HYBRID RAT MODEL. H. Daneshvar, R. Salisbury, and D. Ely. The Dept. of Biology, The University of Akron, Akron, OH 44325**

Blood pressure was compared in genetically hypertensive male rats with normal or deficient androgen receptors (AR). Female King-Holtzman rats, heterozygous for the testicular feminized male (Tfm) trait, were crossed with male spontaneously hypertensive rats (SHR) that were the product of backcrosses for 11 generations to obtain an SHR with SHR autosomes and a WKY Y chromosome (SHR/a) or WKY autosomes and an SHR Y chromosome (SHR/y). Male, female and Tfm (which are AR deficient) siblings were produced in each cross. Blood Pressure (BP) was measured weekly from weeks 8-18. When averaged over 10 weeks, BP in males with a normal AR was higher than that of AR deficient males (151 vs. 144 mmHg, $p<.05$). At 17 weeks of age BP in normal males from an SHR/a father was lower than that in males from an SHR/y father (146 vs. 162 mmHg,$p<.01$). Females from an SHR/a father or an SHR/y father did not have significantly different BP (140 vs.137 mmHg). However, both female groups had a lower BP than normal males (SHR/y) at 17 weeks (140 and 137 vs. 162 mmHg,$p<.01$). In conclusion: 1) BP was elevated in both strains of hybrid males with a functional AR, 2) males with functional AR and a Y chromosome from a hypertensive father and a higher BP than males with normal androgen receptors and a Y chromosome from a normotensive father, and 3) males with intact AR had a higher BP than females.

**9:15 THE EFFECTS OF MANNITOL AND ALBUMIN ON 24 HR. HEART PRESERVATION. G. Dunphy, L. Zawiski, and D. Ely, Dept. of Biology, The University of Akron, Akron, OH 44325**

In vitro heart preservation and reperfusion for 24 hrs. leads to tissue damage and ischemic injury. In order to maintain coronary function, reduction of oxidative damage to reperfused ischemic tissue is required. We assessed whether mannitol (68mM) or albumin (1.4μM in conjunction with additional cardioplegia enhancers decreased free radical formation, edema, and increased cardiac function during 24 hr cold (5°C) heart preservation and warm (37°C) reperfusion in the Langendorff isolated rat heart. A group (n=33) of spontaneously hypertensive rat (SHR) hearts were perfused with one of six solutions: 1) cardioplegia control perfusate, 2) mannitol and no other enhancers, 3) mannitol and no albumin, 4) enhancers and no

mannitol, 5) no mannitol and no albumin, 6) no enhancers. The enhanced cardioplegia without mannitol had the best recovery of contractile function (80%) compared to the same solution with mannitol (51%, p<.001). The hearts without mannitol but with albumin showed the highest recovery of coronary flow (76%) as compared to the group with mannitol(46%, p<.001). Mannitol in the presence of cardioplegia enhancers lowered myocardial edema the most of any solution. However, the groups with mannitol added to the cardioplegia had overall poorer cardiac function (p<.001) than the hearts without mannitol. Therefore, it is our recommendation that mannitol at the concentration of 68mM not be added to cardioplegic solutions, however, albumin at a concentration of 1.4μM is beneficial.

**9:30 LONG-TERM (24-HOUR) RAT HEART PRESERVATION USING AN IRON CHELATOR-MIMOSINE. D. Petrinec, G. Dunphy, and D. Ely. Dept. of Biology. The University of Akron, Akron, OH 44325**

During 24-hour in vitro heart preservation and subsequent reperfusion, irreversible tissue damage occurs caused by reactive oxygen intermediates, such as the superoxide anion, hydrogen peroxide, hydroperoxyl, hydroxyl radicals, and singlet oxygen. Prevention of hydroxyl radical production and the related oxidative damage of reperfused ischemic tissue by free radical scavengers are of primary importance in maintaining heart function. We examined the dose-response effect of mimosine added to a cardioplegia solution in an attempt to maintain 80-90% heart function in the Langendorff isolate rat heart model perfused at 5°C for 24 hours. A group (n=30) of male spontaneously hypertensive rats (SHR) perfused with our enhanced cardioplegia without mimosine served as controls. Two other heart groups with mimosine added to the cardioplegia, were used: 30 mg/L and 180 mg/L. The mimosine treated groups had significantly better left ventricular function than the control hearts after 24 hours of preservation. Systolic pressure was 48% better at the dose level of 30 mg/l and 5% better at the dose level of 180 mg/L as compared to controls. The coronary flow was 37% better at 30 mg/l (p<.05) and 20% better at 180 mg/l (p<.05). This data suggests that mimosine (30 mg/L) may be an effective perfusate additive to prevent iron mediated damage in longterm heart preservation.

**9:45 DIETARY LOW SODIUM INDUCED ELEVATED HEART RATE, AND ELECTROCARDIOGRAPHIC (ECG) CHANGES IN SPONTANEOUSLY HYPERTENSIVE RATS (SHR). D. Steidl and D. Ely, Dept. of Biology, The University of Akron, Akron, OH 44325**

Our laboratory has shown that a low sodium (LNa) diet produced an elevated heart rate (HR) during the period 5-15 weeks of age in SHR. The objectives were to examine the effects of a low Na diet on: heart rate, body weight, ECG, and plasma norepinephrine (NE). We used 5-week-old male SHRs (n=16). The control group (SHR-C) was fed a normal diet of 5mmol Na/100 grams food and the SHR-LNa group was fed 0.5mmol Na/100 grams food. ECG and HR were determined first under anesthetic and then while awake. Plasma NE was determined after ether stress at 9 and 12 wks of age. Body weight of the LNa group was 30% lower than the SHR-C group at 15 wks of age (p<.01). Also, resting HR of the LNa group was 12% higher and ether stress HR was 32% (p<.001) higher than the SHR-C group. The low Na induced elevated HR was eliminated at 15 weeks of age, however, the reduced body weight was maintained. Plasma NE was 27% higher in the low Na group as compared to the controls (p<.01) at 9 weeks, however this difference was eliminated after 12 weeks. ECG analysis showed evidence of ischemic changes in the low Na group around 10 weeks of age which correlated with elevated NE levels. In conclusion, low Na treatment effected growth rate, sympathetic nervous system function and produced ischemic heart changes, all of which tended to be normalized with time.

**10:00 MORE EVIDENCE THAT THE Y CHROMOSOME POTENTIATES A BLOOD PRESSURE RISE IN SPONTANEOUSLY HYPERTENSIVE RATS (SHR). D. Chonko, M. Turner, and D. Ely, Dept. of Biology, The University of Akron, Akron, OH 44325**

The objective of this study was to determine if hypertension in the SHR has a sex-linked and a Y-linked genetic component that may interact with sodium and stress to accelerate the blood pressure rise during development. We have developed two congenic strains by crossing SHR and WKY and backcrossing the offspring to either an SHR mother or a WKY mother. Currently, this has produced an $F_9$ and $F_{10}$ male generation with 99% SHR autosomal genes and a WKY Y chromosome (SHRA strain) or 99% WKY autosomal genes and an SHR Y chromosome ($SHR_Y$ strain). Five male and five female rats from each group (10 weeks of age) were placed on either normal Na chow (0.3% Na) or high Na (3% Na) and placed in a territorial stress population cage. Blood pressure (BP) was measured weekly from weeks 11-20. $SHR_A$ males had higher B.P. than $SHR_A$ females (148 vs 139 mmHg, ANOVA, p<.01) between 12-21 weeks. Also the $SHR_Y$ males had higher B.P. than SHRy females (150 vs 139 mmHg, ANOVA, p<.001) between 17-26 weeks. $SHR_Y$ males on high Na and stress had higher B.P. than $SHR_Y$ control males (196 vs 159 mmHg, p<.001) at 20 weeks. $SHR_A$ males on high Na and stress had higher B.P. than SHRA control males (177 vs 147 mmHg, p<.001) at 20 weeks. In conclusion, 1) the SHR Y chromosome accounts for about 20 mmHg higher B.P. due to high Na and high stress than the SHR autosomes with a WKY Y chromosome ($SHR_A$), and 2) males have a 10 mmHg higher B.P. than females in each strain.

**10:15 SCANNING ELECTRON MICROSCOPY REVEALS THROMBOGENIC DIFFERENCES IN NEW AMPHIPHILIC POLYMER NETWORKS EXPOSED TO IN VITRO HEMOCOMPATIBILITY EVALUATION. A. Caplea, B. Keszler*, J. P. Kennedy* and D. Ely, Departments of Biology and *Polymer Science, The University of Akron, Akron, OH 44325**

New synthetic materials are being developed to provide better arterial grafts for coronary artery bypass and for small arteries that are obstructed by atherosclerosis. One of the important problems to overcome in this area is the development of blood clots (thrombi) in arterial grafts of 5mm diameter or smaller. Therefore, preliminary blood material interactions were studied comparing three different amphiphilic polymer networks synthesized into 4mm grafts. The networks linked hydrophobic polyisobutylene (PIB) with different hydrophilic components. The polymer grafts were connected in series forming a closed loop. A peristalic pump circulated rat blood through the tubing in an attempt to simulate physiologic blood flow. Identical, but individual polymer loops were used for various time intervals (.25, .5, 1, 2 and 3 hrs) to examine clotting tendencies and platelet aggregation. Scanning electron micrographs revealed poly(2-hydroxyethyl methacrylate)-1-PIB and poly(N,N-dimethylacrylamide)-1-PIB as virtually thromboresistant after 3 hours while poly(N,N-diethylaminoethyl methacrylate)-1-PIB was highly thrombogenic after 1 hour. Materials that show thromboresistance after in vitro screening are candidates for more extensive in vivo testing. These unique amphiphilic networks appear to be good candidates for future chronic implant studies.

**10:30 THE EFFECT OF THE SPONTANEOUSLY HYPERTENSIVE RAT Y CHROMOSOME ON GROWTH AND HEART RATE. J. Oehlenschlager, D. Ely and M. Turner. Dept. of Biology, The University of Akron, Akron, OH 44325-3908.**

The Spontaneously Hypertensive Rat (SHR) is a model of human essential hypertension. Crosses between the SHR and normotensive Wistar Kyoto Rat (WKY) have shown that both autosomal loci and the SHR Y chromosome increase blood pressure. Two substrains have been developed to isolate the autosomal and Y chromosome components into two separate substrains, designated SHR/a and SHR/y. The animals used had been backcrossed for 11 generations. The SHR/a carries the autosomal genes of the SHR and the WKY Y chromosome. The SHR/y substrain has an SHR Y chromosome and autosomal loci from WKY. This study was designed to evaluate the effects of the two Y chromosomes on growth and heart rate. Previous studies on growth have used hybrid offspring and have not controlled for the growth effects of hybrid vigor and distinguish it from Y chromosome effects. Newborn SHR/a, SHR/y, SHR and WKY were weighed at birth and weekly thereafter. Starting at 6 weeks of age blood pressure and heart rate were also monitored weekly. Comparisons between SHR and SHR/a will be used to evaluate the effects of the two Y chromosomes (SHR and WKY) in a hypertensive background. The SHR/y and WKY will differentiate their effects in a normotensive background.

**10:45 THE EFFECT OF THE SYMPATHETIC NERVOUS SYSTEM ON THE REGULATION OF SALT APPETITE IN HYPERTENSIVE AND NORMOTENSIVE RATS. N. Bourjeili and D. Ely, Dept. of Biology, The University of Akron, Akron, OH 44325**

The following study examined the effects of social stress and genetic background on salt appetite and salt preference. The objectives were to determine: 1) if hypertensive rats (SHRs) had a higher sodium appetite than normal blood pressure (BP) rats (WKYs) before and after exposure to intruder stress; 2) if salt appetite is affected by sympathetic nervous system activity. Four groups (n=6-8/group) of male rats were studied for 9 months: WKY, SHR, and hybrid rat crosses between a WKY mother and SHR father and the reciprocal cross. All rats were provided with normal Purina rat chow (0.3% Na) and given a four bottle choice of salt water ad libitum (0%, 0.5%, 1.0% and 1.5% NaCl). SHRs and WKYs started to show differences in salt intake at 11 weeks of age which paralleled the rapid rise of SHR blood

pressure with the SHR group having a higher salt intake (42%) before and after exposure to intruder stress. Administration of a noradrenaline depleting drug - reserpine, reduced salt appetite after stress from 20-44% depending on the genetic background of the rat strain. A ß-blocker - propranolol reduced salt appetite considerably in all four strains of rats. The data suggests that the SNS is involved in the regulation of salt appetite and the SHR-WKY difference occurs when the blood pressure starts to rise.

## D. Medical Sciences
## First Afternoon & Business Mtg.
## 1:30 pm, Saturday, May 2, 1992
## College of Business Administration 143
## Marshall Williams, Presiding

**2:00 REGULATION OF NATURAL SUPPRESSOR (NS) CELLS: SUPPRESSION OF AN ANTI CD3 PROLIFERATIVE RESPONSE. S. Oldfield, J.H. Holda. The University of Akron, Dept. of Biology, Akron, OH 44325-3908**

NS cells occur in environments of hematopoiesis, such as fetal spleen and adult bone marrow, and are also found in peripheral lymphoid tissues following cytoreductive treatment. These cells lack phenotypic markers of mature T cells, B cells, and macrophages and have the ability to suppress immune responses in a nonspecific manner. We have examined the ability of NS cells to suppress Con A induced proliferation (Con A stimulates TH-1 cells) as measured by $^3$H-thymidine uptake. These studies show that NS cell activity requires IFN-γ and it can be enhanced by the addition of lymphokines from a TH-2 hybridoma such as IL-3, 4 and 6. In this study we examined the ability of NS cells to suppress a proliferative response in which both TH-1 and TH-2 cells were stimulated. Anti CD3 antibody binds to the CD3 complex associated with the T cell receptor, on all T cells, inducing proliferation. Our studies show that $2.5x10^5$ bone marrow cells from C57BL/6 mice (source of NS cells) suppress the anti-CD3 induced proliferation of $2.5x10^5$ spleen cells (71,000 cpm to 40,000 cpm). If anti IFN-γ antibody is added to the cultures suppression is removed (40,000 cpm to 92,000 cpm) while the addition of exogenous lymphokines, from a TH-2 hybridoma, did not increase suppression. These results suggest that for maximal NS activity lymphokines from both types of TH cells is required.

**2:15 DEPRESSED NEUTROPHIL FUNCTION IN CATS INOCULATED WITH FELINE IMMUNODEFICIENCY VIRUS (FIV). Mary A. Hanlon[1], Louis J. Lafrado[2] and Paul C. Stromberg[2]. College of Dentistry[1] and The Center for Retrovirus Research[2], The Ohio State University, 1925 Coffey Road, Columbus, OH 43210**

Feline immunodeficiency virus-Mt. Airy ($FIV_{MA}$) induces an immunosuppression in cats similar to that seen in other lentivirus infections. Clinical signs of infection include gingivitis, diarrhea, stomatitis, and wasting. In addition, immunosuppression is a sequelae to $FIV_{MA}$ infection. We were interested in the effect of $FIV_{MA}$ infection on feline neutrophils. Neutrophil function was determined by the chemiluminescence (CL) response which measures, in millivolts of potential (mV), the ability of neutrophils to produce cytotoxic reactive oxygen intermediates in response to contact with infectious agents. Six weanling cats were intravenously infected with pretitrated $FIV_{MA}$; 6 naive cats were held as controls. All cats have been followed for 1 year after infection. Neutrophils were enriched from peripheral blood of control and $FIV_{MA}$ infected cats. Isolated neutrophils were stimulated with latex beads (0.800um) and CL responses measured. The data show infection with $FIV_{MA}$ results in a loss of the characteristic biphasic CL response and decrease in peak mV values when compared to control values. The data implicate the loss of normal neutrophil function being responsible for increased susceptibility to opportunistic pathogens.

**2:30 *IN VITRO* ANTIMICROBIAL ACTIVITY OF AMILORIDE ANALOGS AGAINST PSEUDOMONAS. R.C. Cohn, L. Rudzienski, R.W. Putnam. Children's Medical Center, Wright State University, One Children's Plaza, Dayton, Ohio, 45404-1815.**

Amiloride (A) when given as an aerosol to patients with cystic fibrosis (CF), can normalize the increased potential difference across the airway lumen, decrease sputum viscosity, and improve mucociliary clearance. (A) has been shown *in vitro* to have antimicrobial activity in some CF Pseudomonas isolates. The mechanism of action in bacteria is unclear. The effects of specific (A) analogs on Na+/H+ exchange in eukaryotic cells have been studied, but the effect on Pseudomonas is not known. We studied the activity of 5-(N,N-dimethyl) amiloride HCl (DMA), 5-(N,N-hexamethylene) amiloride HCl (HMA), and 5-(N-methyl-N-isobutyl) amiloride HCl (MIA) on 30 Pseudomonas strains as a function of pH at 35°C, 24 hours in Mueller Hinton broth. At pH 7.3, the minimum inhibitory concentration (MIC) range, and [$MIC_{50}$] for amiloride, DMA, HMA, and MIA were 400->800 ug/ml, [>800 ug/ml]; 200->800, [400]; 100-400, [200]; and 100-400, [200]; respectively for *P. aeruginosa* and >800, [>800]; 400->800, [800]; 200-800, [200]; and 200-800, [200]; respectively for *P. cepacia*. Alteration of pH from 5.5 to 8.5 had only a slight effect on potency. We conclude that the analogs HMA and MIA have profound antipseudomonal activity *in vitro*. The mechanism of action may be related to the lipophilicity of these compounds. Supported by the CF and Children's Medical Center Research Foundations.

**2:45 MECHANISM(S) OF MUTAGENESIS BY NON-LETHAL CONCENTRATIONS OF MERCURY (II). M.E. Ariza, J. Holliday and M.V. Williams. The Department of Medical Microbiology and Immunology. The Ohio State University, Columbus, OH 43210.**

Recently questions have been raised concerning the risks associated with exposure to non-lethal concentrations of toxic compounds. While a large percentage of the population is exposed to non-lethal concentrations of mercury, virtually nothing is known at the molecular level concerning the biological effects of such exposure. Using the Chinese hamster ovary cell line, AS52, which contains a stably integrated single functional copy of the *Escherichia coli* xanthine-guanine phosphoribosyl-transferase gene (*GPT*, concentrations (0.1 to 0.3 μM) of mercury (II) which have no effect on cell viability, induced a significant increase in the formation of 6-thioguanine resistant mutants when compared to non-treated controls. To investigate the mechanism(s) by which non-lethal concentrations of mercury (II) were mutagenic, we utilized the replicative form of bacteriophage M13mp2. Exposure of phage DNA to non-lethal concentrations of mercury (II) resulted in an increase in the number of lacZ mutations when compared to non-treated controls. Conversely, mercuration and demercuration of the phage DNA decreased the level of mutations in the lacZ gene. These results suggest that non-lethal concentrations of mercury (II) induce mutations through the transient misalignment of DNA strands.

**3:00 CLONING AND EXPRESSION OF THE STRUCTURAL GENE FROM HERPES SIMPLEX VIRUS TYPE 2 THAT ENCODES FOR DEOXYURIDINE TRIPHOSPHATE NUCLEOTIDOHYDROLASE. A. Cario and M.V. Williams. The Department of Medical Microbiology and Immunology. The Ohio State University, Columbus, OH 43210.**

Herpes simplex virus (HSV) induces approximately 70 polypeptides in permissively infected cells and some of these possess enzymatic activity. One such enzyme is deoxyuridine triphosphate nucleotidohydrolase (dUTPase, E.C. 3.6.1.23). Our studies have demonstrated that the HSV encoded dUTPase can act as a target for the development of agents that inhibit the replication of the virus. However, further studies on the role of the dUTPase in viral replication have been hampered because of the inability to construct cells/virus deficient in dUTPase activity and because of the lack of large quantities of purified enzyme. To overcome these problems, a 1.7 kb cDNA fragment of HSV-2 (strain 333) which contained the structural gene encoding the dUTPase was cloned into the bacterial expression plasmid pGEX-2T. Transformation of the recombinant plasmid into *Escherichia coli* (MV1190) allows for expression of the HSV-2 encoded dUTPase on induction of glutathione S-transferase (GST) gene with isopropyl- -D-thiogalactoside. Analysis of the induced cultures by polyacrylamide gel electrophoresis demonstrated the synthesis of a fusion protion with a molecular weight of 70,000 which is consistent with the molecular weight of GST and dUTPase.

**3:15 ROLE OF HIGH RESOLUTION LIGHT, IMMUNOMICROSCOPY AND ELECTRON MICROSCOPY IN THE IDENTIFICATION OF LUNG AND SELECTED THORACIC TUMORS. Wendy R. Cornett and David L. Mason, Biology Department, Wittenberg University, Box 720, Springfield, OH 45501.**

In spite of our advances in understanding and treating cancer, the incidence of lung cancer has not diminished significantly over the years. One important aspect related to treatment is early and accurate identification and classification of the malignancy. The conventional approach has been to evaluate stained sections of paraffin-embedded tissues by light microscopy.

At times the image information made available by this technique is not sufficient for the pathologist to make an easy and accurate identification. Today, much more information can be made available by employing high-resolution light, immunomicroscopy and electron microscopy. These approaches are considered in the identification and classification of selected malignancies of the lungs and thoracic cavity.

**3:30 ROBOTIC IMMUNOSTAINING OF MALIGNANCIES EMBEDDED IN EPOXY RESIN (SPURR). David L. Mason, Wittenberg University, Box 720, Springfield, OH 45501, Miguel A. Pedraza, and John P. Boblett, Department of Pathology, Community Hospital, Springfield, OH 45501.**

Immunolight microscopy was carried out on a series of malignancies embedded in Spurr by using a computerized robotic capillary action system. Immunoreactions on epoxy embedded sections results in a more highly resolved image of antigen-antibody interaction with reduced background staining. Tissues previously embedded in paraffin can be reprocessed into Spurr with no loss of immuno-reactivity. Using the autostainer provides for quality control, capacity to react more than one case at a time, use of less antibody than for manual staining, and use of the technologist for other procedures while the sections are processing.

**3:45 A FORMULA EXPRESSING NUMBER OF CANCERS TO BE EXPECTED FROM A GIVEN AMOUNT OF POPULATION-REMS EXPOSURE. David Gitlin MD, Westgate Medical Building, Fairview Park, OH 44126**

The formula expressing the number of cancers to be expected from a given amount of population-rems exposure is:

$$\frac{NRc}{D} = C$$

Where N is the population exposed, R is the rems exposure per capita, D is the doubling dose for radiation induced cancer in rems, c is that portion of the death rate from all causes that is due to cancer, and C is the number of cancers to be expected from the radiation exposure in question. The paper to be presented will show how this formula is derived, what constants are used (the value of c and D) and how many man-rems exposure will thus cause a single case of cancer.

**4:00 TIN-ETIOPURPURIN DISTRIBUTION STUDY IN MICE USING LIPOSOMES AS DELIVERY SYSTEM. P. Sekher, M. Mastroianni, A. Bondy, G. M. Garbo. Dept. Chemistry, University of Toledo, Toledo, OH 43606**

Photodynamic Therapy is a relatively new treatment modality for selected neoplastic diseases. It involves parental administration of a photosensitizer, which is somehow retained in malignant tissues, and tumor irradiation with light at the appropriate wavelength. Tin-etiopurpurin (SnET2) is a second generation sensitizer which has been shown to be very effective for the treatment of transplantable bladder tumor in rats. This compound is not water soluble and needs a delivery system to be administer *in vivo*. In this study we selected dipalmitoyl-phosphatidylcholine liposomes as vehicle and we compared encapsulation efficiency and stability of SnET2-liposomes prepared by different methods. Tissue distribution of SnET2-liposomes in C3H/HeJ mice bearing Rif tumor system will also be presented. (supported by NIH Grant PO1-CA48733)

**4:15 HUMAN MORTALITY AND THE SOLAR CYCLE. Nate F. Cardarelli and Mel C. Vye, Engineering and Science Technology Division, The University of Akron, Akron, OH 44325.**

A number of past epidemiological studies have concluded that human morbidity and mortality are associated with changes in heliomagnetism. For example a relationship between sunspot intensity and influenza epidemics is claimed. In order to further study the influence of solar phenomena on human events we have developed two computerized data bases, one containing death certificate information from the City of Akron and the other solar statistics. In this preliminary report we relate population mortality for the years 1909 through 1922, which includes the time span of the great Spanish influenza epidemic, to sunspot activity. Unlike other studies, we have sought correlation between over 200 different listed causes of death and the solar cycle. Associations are strongly positive for tuberculosis, influenza and other respiratory diseases, weakly negative for malignancy and arteriosclerotic disease, and strongly negative for stroke. A hypothesis is offered to explain causation.

**4:30 LEFT VENTRICULAR FUNCTION IN RATS: ACUTE AND CHRONIC ASSESSMENTS. S. Schaus, D. Evans, and N. Paradise. Department of Biology, The University of Akron, Akron, OH 44325-3908, and Akron General Medical Center, Akron, OH 44307.**

The ability to assess left ventricular function in conscious, chronically instrumented rats represents a significant advancement for the study of cardiac function in both normal and diseased states. A system to study *in vivo* left ventricular function of both acute and chronic rat preparations is described and discussed. Using traditional and modified surgical techniques, the rat is instrumented with the following: 1) a Doppler probe in a Silastic cuff on the aortic root; 2) Doppler probe(s) attached to the myocardium; 3) a miniature pressure transducer in the left ventricle; and 4) central venous and arterial cannulas. This instrumentation allows assessment of cardiac output (aortic flow rates and volumes), preload (end-diastolic pressure), contractility indices (dP/dt of left ventricular pressure, percent thickening of the myocardium), and afterload (systemic diastolic blood pressure). The successful implementation of these procedures provides for both acute and chronologic study of left ventricular function in normal rats and rat models of diseases that affect the heart, such as obesity and hypertension.

**4:45 AGE-INDEPENDENT TISSUE CARNITINE LEVELS IN RATS Abdullah Alhomida, Mohammad Shabani and Daniel J. Smith. Department of Chemistry. University of Akron, Akron OH 44325.**

L-Carnitine facilitates mitochondrial beta-oxidation of long-chain fatty acids in most tissues of the body. Typically, intracellular carnitine concentrations range from 1-10 mM in skeletal muscle and heart. Normal circulating carnitine concentrations are 10-80 uM in most mammals, including rats, dogs and humans . Carnitine deficiency associated with impairment of muscle function has been described in infants and young adults as a result of inherited or acquired disease. In a recent report it has been shown that skeletal and heart muscle from 6 month old mice had a marked reduction of carnitine and carnitine esters compared to 6 week old mice. In our lab it has been shown that there was no statistically significant decrease of carnitine and carnitine esters in the blood, skeletal and heart muscle, and liver from rats with ages of 6 weeks, 3, 6, 9 and 12 months . Therefore, carnitine and carnitine esters levels were independent with age in rats.

## D. Medical Sciences
## Second Afternoon
## 2 :00 pm, Saturday, May 2, 1992
## College of Business Administration 144
## Lee A. Meserve, Presiding

**2:00 SUPPLEMENT USAGE IN HIGH SCHOOL AND COLLEGIATE WRESTLERS J.C. Marshall and D.M. Spillman PhD. 166 McGuffey Hall, Miami University, Oxford, OH 45056**

Forty-five high school and 35 collegiate wrestlers responded to a survey concerning supplement use during their wrestling season. The supplements taken included vitamins, protein, amino acids, high carbohydrate supplements and steroids. Most often consumed were vitamin and protein supplements. Eighty-seven percent (30) of the college wrestlers took the supplement as a preventive measure. This was defined by the wrestlers as maintaining good health and the competitive edge during the "making weight" periods. Sixty-two percent (28) of the high school wrestlers also consumed supplements as precautionary measures. The collegiate wrestlers (76%) and high school wrestlers (88%) took supplements for "adherence" reasons. "Adherence" was defined by the wrestlers as a continuance of strength and energy level while "making weight" and throughout the wrestling season. Of those wrestlers taking supplements for preventive reasons all agree (100%) that the supplement was for physiological need and 24% said that it also gave a psychological boost and 79% used them for physiological need.

**2:15 EXERCISE TRAINING ALTERS RESPONSE TO DIPSOGENIC CHALLENGE. Eberwine, S.; Purvis, A.; Cox, R.; Wiley, R. Depts. of Zoology and PHS, Miami University, Oxford, OH 45056**

Several lines of evidence suggest that exercise training alters the mechanisms which regulate fluid volume. Thirst is one of the mechanisms used by the body to maintain homeostatic control over fluid volume. The purpose of these experiments was to determine if there was a difference in

drinking (fluid intake) between exercise trained (T) and nontrained (NT) *rats* in response to isoproterenol (Beta agonist, 33 ug/kg, SC), yohimbine (alpha antagonist, 3 mg/kg) or polyethylene glycol (PEG, 20%). These compounds have been shown to elicit thirst. Forty Sprague Dawley normotensive male rats served as subjects and were randomly assigned into T or NT groups. The NT rats were handled daily, while the T rats swam five days per week for two hours per session in 20 gallon tanks at a water temperature of 35±2°C. All dipsogenic agents were administered subcutaneously and the intake of either $H_20$, 1% or 2% saline was monitored. It was found that T rats drank more $H_20$ over a 2 hr period in response to isoproterenol (8.7 ml vs. 5.8 ml) and more 1% saline in response to yohimbine (9.0 ml vs 3.7 ml) than did the NT. The results for PEG were less clear (40.8 vs 37.5 ml/kg in 8 hr). The differences between groups could have resulted because higher blood levels of the two drugs were achieved in the T because of a lower bodyweight (less fat). However the consistently greater effect seen in the T suggest that sensitivity to dipsogenic stimuli is increased by training. Supported in part by Howard Hughes Medical Institute.

**2:30 COMPARISON OF SUCROSE PREFERENCE IN VASOPRESSIN-CONTAINING AND VASOPRESSIN-DEFICIENT RATS. Steven W. Graeca, Cyrilla H. Wideman, and Helen M. Murphy. John Carroll University, Cleveland, OH 44118.**

This experiment studied the preference of four different concentrations of sucrose in vasopressin-containing (LE) and vasopressin-deficient (DI) rats under ad-lib (days 1-6) and food-restricted (days 7-14) conditions. In both strains, an 8% sucrose solution was preferred over the remaining three concentrations (0%, 16%, and 32% sucrose solutions). The DI animals consumed significantly more 8% sucrose solution than LE animals during the habituation period. During the experimental period, both strains preferred the 8% sucrose solution over the other concentrations, but the DI preference was more pronounced. As the experimental period continued, the preference of LE animals changed with a gradual decrease in intake of 8% sucrose solution and a gradual increase in 32% solution. No significant differences were observed in the food intake and body weight measurements between the two strains. It appears that vasopressin, directly or indirectly, is involved in the modulation of caloric intake.

**2:45 THE INFLUENCE OF VASOPRESSIN ON TOTAL PROTEIN AND UREA NITROGEN LEVELS IN URINE. Brian T. McDermott, Cyrilla H. Wideman, and Helen M. Murphy. John Carroll University, Cleveland, OH 44118.**

Studies were conducted to determine the effect of food-restriction stress on total protein and urea nitrogen levels in urine in vasopressin-deficient (DI) and vasopressin-containing (LE) rats. The rats were first exposed to a habituation period of 7 days with ad-lib access to food and water, followed by an experimental period of 9 days in which the rats were fed for 1 hour in 24 hours. Prior to food restriction, total protein and urea nitrogen levels in DI animals were significantly higher than those in LE animals. Following the first day of food restriction, total protein levels decreased in both strains and remained fairly constant. Following the first day of food restriction, urea nitrogen levels of DI rats decreased; whereas, urea nitrogen levels of LE rats increased. By the second day of food restriction, urea nitrogen levels of DI animals increased significantly, while levels of LE animals returned to pre-food-restriction values. Possibly, increased amino acids were deaminated and the carbon skeletons used as a source of energy production with vasopressin acting as a regulating agent in LE animals.

**3:00 A NEW METHOD OF QUANTIFYING MALE TISSUE IN CHIMERAS OR GYNANDROMORPHS. R. Rastogi, M. Johnson and M. Turner. Dept. of Biology, The University of Akron, Akron,OH 44325-3908.**

In the Spontaneously Hypertensive Rat (SHR), genes on the Y chromosome contribute to about 30mm Hg rise in blood pressure. In an attempt to study the hypertensive loci of the SHR Y chromosome, we have made fusion gynandromorphs. These individuals have both male and female cells in their tissues. We have developed the following method to quantify the relative amounts of male and female cells. Total DNA is isolated from tissue and fixed to a Zeta-probe membrane using a dot blot apparatus. A series of known mixtures of male and female DNA are added to each filter as standards. These filters are then hybridized to 32p labeled DNA probes and counted using a Betascope (Betagen). By hybridizing each filter, sequentially, to both a Y specific probe (Sry) and an autosomal probe (Pyruvate Kinase), the resulting counts can be used to estimate the amount of male DNA and thus male cells in the sample. A series of controls and blind trails are described which test the reliability and repeatability of the method.

**3:15 PHARMACOKINETIC AND PHOTODYNAMIC THERAPY (PDT) STUDIES WITH BIS(DIISOBUTYLOCTADECYLSILOXY) SILICON 2,3-NAPHTHALOCYANINE (isoBOSINC). M.M. Zuk(1,2), B. Rihter(3), M.E. Kenney(3), M.A.J. Rodgers(2) & M. Kreimer-Birnbaum(1) (1)Research Dept., St. Vincent Med. Ctr., 2213 Cherry St., Toledo, OH 43608; (2)Ctr. for Photochemical Sciences, Bowling Green State Univ., Bowling Green, OH; (3)Dept. of Chemistry, Case Western Reserve Univ., Cleveland, OH**

IsoBOSINC is a representative of a group of naphthalocyanine derivatives with spectral and photophysical properties that make them attractive candidates for PDT of solid tumors. IsoBOSINC was delivered to normal and tumorbearing rats by intravenous injection as a suspension either in 10% Tween 80 in saline or 10% Cremophor EL + propylene glycol in saline. For each carrier system two doses were studied: 0.25 mg/kg and 0.50 mg/kg of body weight. When isoBOSINC was injected in Tween, it showed two compartment kinetics in serum, with a t1/2 for the distribution phase of 5 hours; while the corresponding value was 14 hours in Cremophor. The t1/2 of the elimination phases were 10 and 21 hours in Tween and Cremophor, respectively. For each vehicle no significant differences in elimination t1/2 were found, neither for the two doses nor for the tumor-carrying animals vs. controls. Responses to PDT seem to be time- and vehicle-dependent. [Supported by grants from NIH CA-46281, the F. M. Douglass Foundation, and the Geiger Foundation for Cancer Research.]

**3:30 EFFECT OF PRE- AND POSTNATAL PCB EXPOSURE ON GROWTH, THYROID STATUS, AND ChAT ACTIVITY IN 60 DAY OLD RATS. L.A. Meserve, L.M. Juarez de Ku, B.W. Seo, M.A. Baratian, and A. Woo. Department of Biological Sciences, BGSU, Bowling Green, OH 43403-0212**

Previous studies in our laboratory have found incorporation of PCB in the maternal diet to decrease rate of growth and to depress thyroid status and ChAT (choline acetyltransferase) activity in 15- day-old rats. The present study extends these investigations to rats 60 days old. PCB was fed as either 125 ppm or 250 ppm of ground mash diet, and was given to rats from the first day of pregnancy. All rat pups were separated from the mother after 28 days and were continued on the same diet to 60 days of age. Addition of PCB to the diet did not alter food intake of mothers or pups. Depressed growth rate was proportional to PCB dose, with final weights more variable in 250 ppm pups than in 125 ppm. Circulating levels of the thyroid hormones continue to be depressed at 60 days of age, with depression proportional to PCB dose. Activity of ChAT in hippocampus and basal forebrain was close to normal in 125 ppm pups, but remained depressed in 250 ppm. Taken with previous data, the present study confirms complexity of PCB effects on development. [Supported by a BGSU Faculty Research Committee Grant.]

**3:45 LIPOPROTEIN BINDING CHARACTERISTICS OF TIN-ETIOPURPURIN IN WHITE NEW ZEALAND RABBITS SERUM: COMPARISON BETWEEN *IN VITRO* INCUBATION AND *IN VIVO* DISTRIBUTION. V. Ramamurthy, A. Bondy and G. M. Garbo, Dept. Chemistry, University of Toledo, Toledo, OH 43606**

Photodynamic therapy is an evolving modality for treatment of solid tumors which is based on the use of tumor localizing photosensitizers fallen by irradiation with visible light. Tin-etiopurpurin is a second generation sensitizer which has been shown to be very effective for treatment of transplantable tumor models in rodents. It has been extensively reported that Low Density Lipoproteins seem to play a determinant role in the delivery of porphyrins to tumor cells. In this study we examined the lipoprotein distribution of SnET2 in Cremophor El emulsion both after serum incubation *in vitro* and after intravenous injection in White New Zealand Rabbits. The rabbit serum used for *in vitro* incubation was obtained from the same animals that were successively injected, to avoid large variation in the lipoprotein profile. (Supported by NIH Grant PO1-CA48733)

**4:00 TISSUE $CO_2$ STORES, ACID-BASE BALANCE, AND BODY TEMPERATURE IN REPTILES AND AMPHIBIANS. D. Newlon and J. Stinner, Dept. of Biology, The University of Akron, Akron, OH 44325.**

Many studies have been done on the effects of body temperature on acid-base changes in air-breathing ectotherms. However, the role of carbon dioxide has largely been ignored despite the fact that over 50 years ago it was shown that there are large changes in whole-body $CO_2$ stores as reptiles and amphibians undergo changes in body temperature. The purpose of the study was to: 1) examine more species of reptiles and amphibians to

see if this phenomenon is a general one, and 2) determine the source(s) of these changes in $CO_2$ by analyzing various tissues in the cane toad *Bufo Marinus*. Cooling cane toads, desert iguanas, and western diamond-back rattlesnakes 20°C produced an increase of approximately 1mmol/Kg in whole body $CO_2$. In *B. Marinus* red blood cell, arterial plasma, and mixed venous $CO_2$ remained constant at 10.3±2.3, 24.1±2.7, and 24.9±2.4 mM respectively. Cooling also had no affect on calcium levels in the plasma, which were constant at 6-8 mg/dl, suggesting that bone is not involved. Other tissues not affected by temperature include the esophagus, stomach, liver, and seven skeletal muscles. However, $CO_2$ increased significantly in the lung (2.9 mM), small intestine (4.7 mM), ventricle (2.1 mM), and the internal and external oblique (6.1 mM). It is concluded that the effect of temperature on whole-body $CO_2$ stores is probably general and the changes in these $CO_2$ stores occur only in a few tissues. A future study of intracellular pH in these tissues is needed.

**4:15 PLASMA VOLUME MEASUREMENT IN TRAUMA, SEPSIS AND SEPSIS-TRAUMA RATS. Ming H. Chiu and Ronald H. Birkhahn, Department of Surgery, Medical College of Ohio, Toledo, Ohio, 43699**

The knowledge of plasma volume (PV) in trauma and/or sepsis is a prerequisite for many metabolic studies using isotopic tracers in plasma. PV was measured in traumatized, septic, septic-traumatized, and control rats. Sprague-Dawley male rats (n=41), weighing 250 g, were anesthetized, and received trauma by bilateral femur fracture, sepsis by cecal ligation and puncture, or both for sepsis-trauma. Catheters were put into both jugular veins, control rats were pair-fed with their treatment rats. Two days after surgery, 2 mg of indocyanine green (IG) solution was injected through catheter and sampled from the other at 2, 5, 8, 12 min. The plasma IG concentration was measured at 805 nm. Concentration at 0 was obtained by a semilog regression of the samples. PV for control rats was 3.20 ±0.26ml/ 100 g body weight. PV for traumatized rats was 2.93±0.06ml, which was similar with PV in controls, while PV for septic was 3.98±0.20ml and for sepsis-traumatized was 3.97±0.29 ml, which were significantly greater than PV in controls. (Funded by NIH GM39329)

**4:30 RESTING ENERGY EXPENDITURE IN THE SEPTIC RAT. Qixin Sun and Ronald H. Birkhahn, Department of Surgery, Medical College of Ohio, Toledo, OH 43699.**

Changes of resting energy expenditure (REE) and nitrogen balance (NB) were measured in 9 month old septic rats. REE was measured from $CO_2$ output and $O_2$ uptake and NB from the difference between 24 hours intake and urinary output. Six days of baseline REE and four days of baseline NB were obtained for all rats. After baseline measurement, rats were divided into two groups: septic (n=8) and control (n=8). All rats were anesthetized and septic rats received cecal ligation and puncture. Liquid diet and water were provided *ad libitum* to all rats throughout the whole experiment. REE and NB were measured daily for 7 days after stress. Sepsis began to significantly increase REE on day 2 and the highest increase was about 2.00 kilocalorie/day/100g body weight (17% up) on day 4. Sepsis began to significantly lower NB on day 1 and the lowest decrease was about 45mg/day/100g body weight (103% down) on day 3 compared to the control group. REE changes lasted over 7 days while NB changes lasted about 5 days. This study shows that both REE and NB responded to sepsis in 9 month old rats. (Funded by NIH GM 39329.)

**4:45 RESTING ENERGY EXPENDITURE AND NITROGEN BALANCE IN BURN RATS. Qing Yang and Ronald H. Birkhahn, Department of Surgery, Medical College of Ohio, Toledo, OH 43699**

Resting energy expenditure (REE) and nitrogen balance (NB) were investigated in the burn rats for 4 days before and 10 days after injury. Body weight, food intake and 24h urine output were recorded daily. Base line REE was determined by measuring $CO_2$ and $O_2$ exchange and NB was calculated from the different of nitrogen intake and output for over 4 consecutive days before inducing burn injury. Then nineteen male Sprague-Dawley rats were divided into body weight-matched Burn group (B group, n=12) and Control group (C group, n=7). B group rats were induced 30% total body surface area (TBSA) full thickness scald under anesthesia, and C group rats were anesthetized without scalding. Burn rats were fed *ad libitwn* for 10 days after injury, and control rats were pair-fed. The results showed that the burn rats, compared to the controls, had 39% (21% - 46%) increased REE from the day 2 through day 10, and 51% lower (-27% - -80%) NB from day 2 to day 5 postburn. These findings suggested that the hypermetabolic period in 30% TBSA burn rats lasted at least 10 days. (Funded by NIH grant GM 39329.)

## D. Medical Sciences
## Poster Session
## Saturday, May 2, 1992
## College of Business Administration Concourse

**BOARD A**

**2:00 A SEARCH FOR "WEIL-FELIX TYPE" ANTIGENS APPLICABLE TO THE DIAGNOSIS OF VIRAL DISEASES. Donald M. McKinstry. The Pennsylvania State University at Erie, The Behrend College, Station Road, Erie, PA 16563-1200.**

Fifty-four bacterial strains were screened against six different antiviral sera by the rapid slide agglutination technique in a search for bacterial antigens of diagnostic applicability to viral diseases. The strains were selected from the following genera: *Pseudomonas, Xanthomonas, Agrobacterium, Chromobacterium, Alcaligenes, Escherichia, Aerobacter, Erwinia, Serratia, Proteus, Salmonella, Shigella, Staphylococcus, Gaffkya, Sarcina, Neisseria, Streptococcus, Corynebacterium, Arthrobacter,* and *Bacillus.* These genus names were all valid at the time of this research. The sera were as follows: coxsackie type B-1, echo type-9, adenovirus type-3, poliovirus type-1, rubella Gilchrist strain, and parainfluenza type-2 Greer Strain (Chanock). Thirty strains were agglutinated by one or more of the viral antisera. However, these results appear non-specific since agglutination was also observed with normal sera.

**BOARD B**

**2:00 FUNCTIONAL AND HISTOLOGICAL CHARACTERIZATION OF A NEW RAT MODEL OF HEART CARDIOMYOPATHY. Gun Tobisson and Daniel Ely, Dept. of Biology, The University of Akron, Akron, OH 44325**

During the past 3 years our laboratory has been developing through selective breeding new rat strains for studying hypertension. In the process we noticed that hearts from these animals were very stiff with a greatly reduced ventricular chamber. The two rat strains are designated $SHR_A$ and $SHR_V$ and are F-11 generation backcrosses to either a hypertensive or normotensive parent. Isolated left ventricular function studies showed that the starling systolic pressure-volume curves were similar in both strains as compared to control SHR, but coronary flow was higher in both $SHR_A$ and $SHR_V$ than controls ($p<.05$) but contractility was marginally reduced. Electrocardiographic analysis showed a significant reduction in QRS width (13%-55%) of $SHR_A$ and $SHR_V$ and significant S-T segment depressions as compared to controls. Histological analysis showed a concentric hyperplasia which narrowed the left ventricular chamber by 50-75%. Fibrosis was not present, but the increased cellular proliferation was present in right and left ventricles. Current studies are exploring the genetic basis for this heart abnormality. This new animal model may provide insights into the genetic control of heart growth, development, and pathophysiology.

**BOARD C**

**2:00 RAPID POSITIVE IDENTIFICATION OF GENETIC SYSTEMS AFFECTING NUTRITIONAL PRODUCTION EFFICIENCY. G. S. Bambeck Ph.D. & R. M. Gesinski Ph.D., ZAXIS INC., 1658 State Rd., Cuyahoga Falls, OH 44223**

From the farm site to the marketplace, nutritional efficacy and efficiency depends much upon the numerous interactions of environmental/genetic systems interfaces. This includes such variables as hybrid development, cultivar strain to geographical condition matching, predatory, parasitic and disease micro-organism impingements, silage/spoilage conditions and others. A single, simple technology which could rapidly and genetically "fingerprint" any life form would be a boon to USDA, DNR, environmental, seed bank, veterinary, forensic, medical and other researchers. The Geltrek Microgel System is an extremely rapid "on site" field ready ultra high resolution (UHR) (PAGE) electrophoresis system which can run up to 66 samples per hour and typically yields 40-60 polypeptide bands per lane. Such DNA expression fingerprint (DEF) "Barcodes" permit subspecies identification of virtually any life form on earth. Widespread use of Geltrek would ultimately provide scientists with a huge DEF "Barcode" library, from which innumerable identifications, inferences and conclusions could be drawn.

**BOARD D**

**2:00 HYPONATREMIA IN ACUTE SPINAL CORD INJURY. B.W. Seo, Dept. of Biological Sciences, Bowling Green State University, Bowling Green, OH 43403 and W.T. Peruzzi, Section of Respiratory Care, Department of Anesthesia, Northwestern University Medical School, Chicago, IL 60611**

Information about the nature and frequence of hyponatremia, low serum sodium (Na) levels, within acute spinal cord injury (SCI) patients has been previously unavailable. In this present study, the medical records of all patients admitted and discharged from the Midwest Regional Spinal Cord Injury Services Center (MRSCISC) from 1988 and 1989 were retrospectively reviewed. Hyponatremia was defined as a Na level <135 mEq/L after correction for hypoglycemia. Of the 383 patients reviewed, 101 were excluded because their injuries occurred greater than 24 hrs prior to admission to the MRSCISC. Hyponatremia occurred in 82 of the 282 patients reviewed (29%). Differences in incidence of hyponatremia based on level of injury were not significant. The occurrence of hyponatremia in association with Frankel classification (amount of neurological injury, A being a complete neurological lesion while E being an intact spinal column) was significantly different ($p < 0.0001$): A=29/47 (62%), B=10/21 (48%), C=9/22 (41%), D=10/43 (23%), E=24/149 (16%). Potential mechanisms for these derangements include alterations in the secretion of ADH, components of the renin-angiotensin-aldosterone system, and/or the secretion of ANF.

**BOARD E**

**2:00 POSITIVE AND NEGATIYE EFFECTS OF COLD SWIM STRESS ON CELLULAR IMMUNE RESPONSES IN THE RAT. J. Shu and J. R. Stevenson. Dept. Biological Sciences, Kent State Univ., Kent, OH 44242.**

The effects on blood and spleen lymphocytes of male Sprague-Dawley rats of three three-minute swims within 12 hours or five three-minute swims over five days in water of different temperatures were compared in order to determine which stress levels have positive and which negative effects. The rats swam individually in a tank containing water 30 cm deep at a temperature of 15°, 8°, or 4°C. Following five days of daily swims between 8:00 and 9:00, rats were killed 3 hours after the last swim. Responses to Con A and LPS, IL-2 production, and natural killer (NK) activity were higher after swims at all three temperatures than control responses. Percent CD4 and CD8 cells varied differently in spleen and blood according to the temperature. Following swims at 20:00, 23:00, and 7:00 the next day, rats were killed at 10:00. Responses to Con A and LPS and IL-2 production were depressed after the swims. NK activity did not significantly change. Both CD4 and CD8 percents declined after the 15°C swims, but not after the 4°C swims. Serum corticosterone was elevated after both 1-day and 5-day swims at all temperatures tested. In general, the 1-day stress depressed the immune parameters studied and the 5-day stress enhanced them.

**BOARD F**

**2:00 ENHANCED IMMUNOGENICITY OF DIETHYLNITROSAMINE (DEN)-INDUCED FORESTOMACH CARCINOMAS OF BALB/C MICE AFTER *IN VITRO* CULTIVATION. Roudabeh J. Jamasbi, Medical Technology Dept., B.G.S.U., Bowling Green, OH 43403.**

The immunogenicity of DEN-induced forestomach carcinomas in female BALB/c mice was investigated following *in vivo* and *in vitro* cultivation. Of the five tumor lines, $DEN_1$ $DEN_3$, $DEN_6$, $DEN_8$ and $DEN_9$ studied, only $DEN_6$ and $DEN_8$ showed some degree of immunogenicity. $DEN_1$, $DEN_3$ and $DEN_9$ were highly tumorigenic with little immunogenic potency as determined by the tumor transplantation-excision assay, and antibody binding tests. $DEN_1$ and $DEN_3$ metastasized readily. Cultured cell lines established from $DEN_1$, $DEN_3$, $DEN_6$ and $DEN_9$ showed epithelial characteristics and produced squamous cell carcinomas upon *in vivo* inoculation. $DEN_6$ and $DEN_9$ cell lines lost their tumorigenicity at the fifth and fortieth passage, respectively. $DEN_1$ and $DEN_3$ maintained their tumorigenicity up to the 50-l00th *in vitro* passage, but the number of cells required to produce tumors increased substantially and their ability to metastasize was lost. Tumor transplantation studies of these cultured cell lines in normal and X-irradiated recipients suggested that the decrease in tumorigenicity may be immunologically mediated. The exposure of the cell lines to periodic acid increased antigen-antibody binding significantly, suggesting possible masking of the antigenic determinant(s) by some molecules carrying carbohydrate components. (Supported by an FRC grant.)

**BOARD G**

**2:00 AN OVERVIEW OF CURRENT LITERATURE AND RESEARCH ON THE PARASITIC PROTOZOAN GIARDIA LAMBLIA AND THE ASSOCIATED DISEASE GIARDIASIS. R.S. Walter and G.E. Klee, Kent State University-Stark Campus, 6000 Frank Ave., NW, Canton, OH 44720-7599**

Worldwide, *Giardia lamblia* is the most frequently isolated intestinal protozoan and the most common pathogenic parasite in the United States. Furthermore, it has been estimated that up to 43% of all surface waters may be contaminated with *Giardia* cysts, including waters isolated from most human activity. Another concern is cyst transmission through sexual activity; in one estimate done in New York City, the number of homosexuals infected with the cysts ranges from 10,000 to as many as 50,000. Cysts are quite resistant to standard chlorination and other chemical water treatment, also. Although once thought to be highly host specific to man, there may be a serious threat of cross transmission between many other mammals and man, too.

**BOARD H**

**2:00 HEPATIC COPPER AND ZINC IN STREPTO ZOTOCIN(STZ) INDUCED DIABETES IN SPRAGUE-DAWLEY RATS. R FULLER, K.A. CRIST, E ORLOWSKI, A. ASKARI, P. CHAUDHURI. Med College of Ohio, P.O. Box 10008, Toledo, OH 43699.**

Two doses of STZ (60 mg/kg or 120 mg/kg) were injected IP in rats at 40 days of age to induce a non-insulin dependent (NIDDM) or insulin dependent (IDDM) diabetes, respectively. The control group received no STZ. The IDDM group received 1 unit of protamine zinc insulin suspension sq each day. Rats were fed standard rat pellets with zinc and copper concentrations of 70.0 ppm and 18.0 ppm, respectively. Rats were terminated and liver specimens taken at 42 days (IDDM), 106 days (NIDDM) and 105 days (control) post STZ injection.

| Group | Mean intake (gm/wk) | Mean Wt Gain (gm) | Copper Level (µg±SD) | Zinc Level (µg±SD) |
|---|---|---|---|---|
| Control | 116±8 | 127±17 | 5.45±0.5 | 23.8±3 |
| NIDDM | 181±68 | 97.5±30 | 5.73±0.7 | 26.5±4 |
| IDDM | 209±66 | 101±15 | 5.60±1.0 | 23.2±3 |

Both weight gain and food intake were significantly different among groups. However, no difference in hepatic copper and zinc level were detected. We conclude that chronic diabetes induced by varying doses of STZ do not significantly alter hepatic copper or zinc levels.

**BOARD I**

**2:00 COMPARISON OF URINARY LOSSES OF MALE AND FEMALE TRAUMATIZED RATS. Augusta Askari, Qing Yang, Eugene Orlowski, Neil R. Thomford, Ronald H. Birkhahn, Medical College of Ohio, Toledo, OH 43699.**

Trauma results in different levels of protein losses by male or female subjects; however, since most research concerning trauma has studied the metabolic responses of male subjects, very little else is known about the physiological impact of trauma upon females. Therefore, 9-month old male (n=14, wt=500g) and female (n=16, wt=365g) *Sprague-Dawley* rats were caged individually and fed liquid rat diet *ad libitum*. After being anaesthetized with ip ketamine.HC1 and acepromazine, rats underwent bilateral femur fractures. 24-hour urines were collected prior to trauma and for 5 days post-trauma. Urinary minerals were measured by atomic absorption. Losses by male or female rats differed significantly for zinc on post-trauma days 1, 2, 3 and for calcium on day 3. Differences in magnesium excretions fluctuated. Thus, whole body metabolic responses to injury by male or female subjects do indeed differ in various parameters. (Partial funding GM 39329)

**Board K**

**2:00 ORAL TACTILE SENSORY DIFFERENCES BETWEEN NORMAL AND DYSFLUENT SPEAKERS. Donald Fucci, School of Hearing & Speech Sciences, Ohio University, Athens, OH 45701; Linda Petrosino, Department of Communication Disorders, Bowling Green State University, Bowling Green, OH 43403**

The purpose of this study was to investigate differences in tactile sensory system function between stutterers and normal speakers. This task was accomplished by studying possible tactile threshold shifts occurring during magnitude estimation scaling of vibratory stimuli presented to the dorsal

surface of the tongue. Ten normal speaking men (M age = 19.7 yr.) and 10 stutterers (M age = 25.9 yr.) participated. Analysis suggested that stutterers and normal speakers differ in terms of the responsiveness of the sensory mechanism responsible for lingual tactile threshold to vibratory stimulus intensities applied at suprathreshold levels. The stutterers and normal speakers performed similarly on all aspects of the magnitude estimation scaling tasks, but the amount of threshold shift occurring during the scaling procedures was significantly greater for the stutterers at each suprathreshold intensity level employed.

## E. Physics & Astronomy
## Only Morning
## 9:00 am, Saturday, May 2, 1992
## College of Business Administration 131
## Dr. Tom Schmidlin, Presiding

**9:00 QUANTUM THEORY AND GRAVITATION, G. M. Townsend, Department of Physics, The University of Akron, Akron, OH 44325-4001.**

Einstein's Theory of Gravitation assumes that particles have a classical nature. We look at how the theory changes when one assumes that particles have a quantum nature, so that their path through space-time cannot be well defined by curves. The implications of this for black-hole physics will be pointed out.

**9:15 X-RAY AND NEUTRON REFLECTOMETRY FOR THE STUDY OF THIN FILMS. Bradley Welch and Timothy Vierheller, The University of Akron - Wayne College, 10470 Smucker Road, Orrville, OH 44667**

Neutron reflectometry (NR) and x-ray reflectometry (XR) are tools for the investigation of thin films. The techniques are sensitive to film surface structure, composition, and thickness. Both NR and XR are based on radiation striking a sample surface at a glancing angle 0. The radiation intensity reflected away from the sample at angle 0 (specular reflection) is sensitive to the composition profile perpendicular to and within about 3000 angstroms of the sample surface. The difference between XR and NR is the dependency of XR on electron density while NR relies on neutron scattering length density. This difference in sensitivity leads to XR and NR being used as complementary techniques. Examples presented on the use of these techniques include the characterization of Langmuir-Blodgett deposited layers of Cadmium Arachidate and a polyglutamate.

**9:30 PROPERTIES OF PLANCK PARTICLES. Gerardus D. Bouw. Baldwin-Wallace College, Berea, OH 44017.**

Recent cosmological models have involved concepts such as strings and virtual particles (called "Planck particles" in quantum mechanics) which basically result from combinations of fundamental constants and have these properties (all units in what follows are c.g.s. and all are orders of magnitude only): mass=$10^{-5}$, length=$10^{-33}$, time=$10^{-44}$. The length is not only the deBroglie wavelength for the mass, but is also the black hole radius for that mass. Heretofore the existence of Planck particles is considered ephemeral, but treating them as a medium in mechanical equilibrium, on which the material universe is a slight perturbation, gives interesting results including: a resonance frequency of $10^{78}$, speed of "sound" of $10^{107}$, an angular velocity of $10^{-5}$ for the entire system and an additional rotational angular velocity of $10^{-26}$ for the stellar universe relative to the Planck medium; just below the limit of detectability. The theory places an upper limit on the mass of a single elementary particle of a Planck mass. For particles below that mass the Planck medium is transparent, above it, the medium is opaque.

**9:45 PROBING THE NUCLEAR MATTER EQUATION OF STATE WITH NEUTRONS FROM NUCLEUS- NUCLEUS COLLISIONS. M. Elaasar, R. Madey, W. Zhang, J. Schambach, D. Keane, B. D. Anderson, A. R. Baldwin, J. W. Watson, Kent State U.*, Kent, OH 44242.; G. Westfall, Michigan State U.*, East Lansing, Mi 48824-1116; G. Krebs, H. Wieman, Lawrence Berkeley Laboratory, Berkeley, CA 94720; C. Gale and K. Haglin, McGill U., Montreal, Que., Canada H3A-2T8.**

The nuclear matter equation-of-state (EOS) is important for understanding nuclear matter under extreme conditions of density, temperature, and pressure that are relevant for astrophysical objects such as supernovae and neutron stars. The EOS is a crucial ingredient also in modern theories of relativistic nucleus-nucleus collisions. We report results from Bevalac experiment 848H of triple differential neutron cross-sections from high-multiplicity collisions of equal mass nuclei. The azimuthal distribution of neutrons with respect to the reaction plane constrains the incompressibility modulus in the EOS. *Supported in part by the National Science Foundation.

## F. Geography
## Only Morning
## 9:00 am, Saturday, May 2, 1992
## College of Business Administration 134
## Henry Moon, Presiding

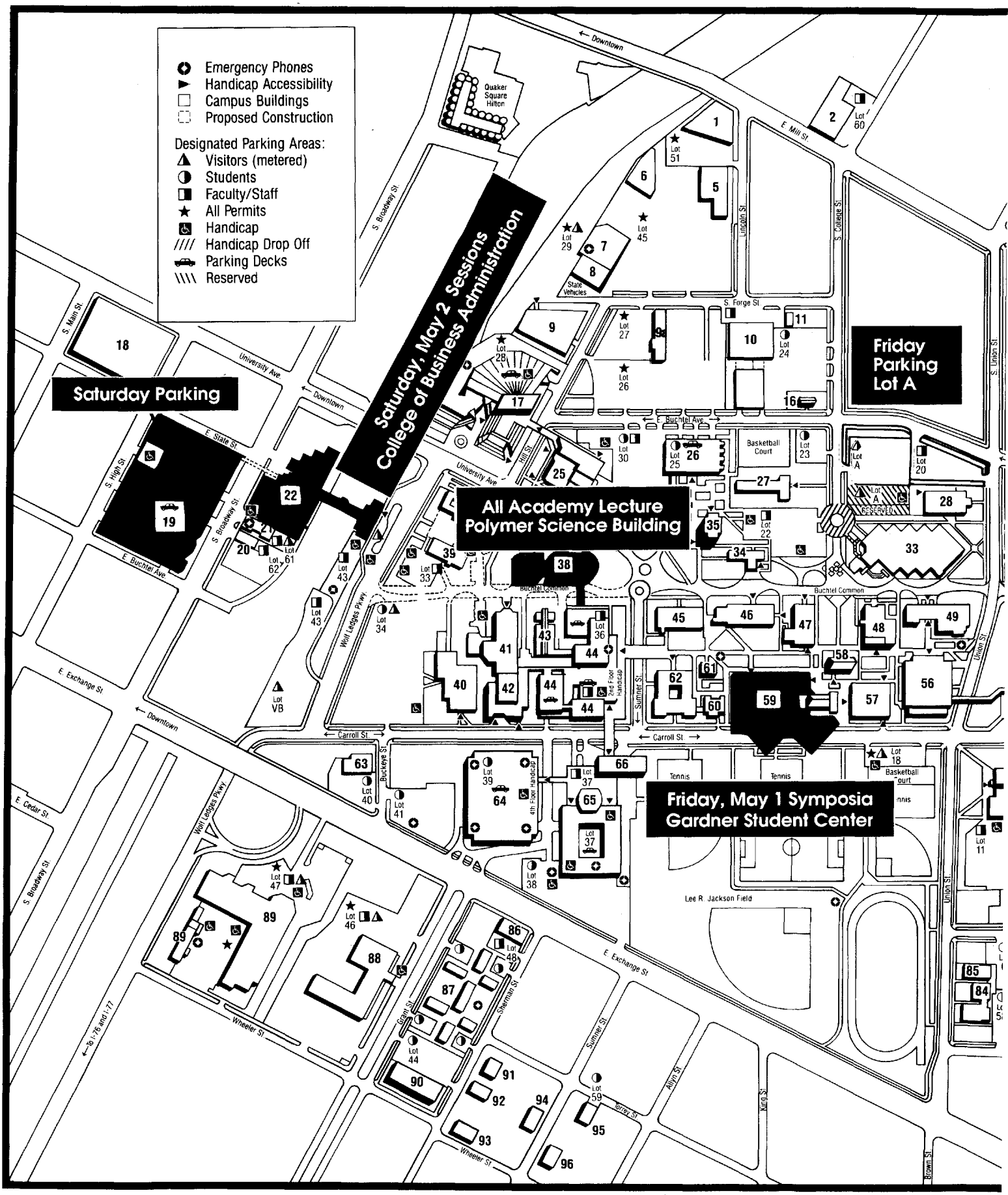
**9:00 INVESTIGATION OF REFORESTATION AS A MITIGATIVE MEASURE FOR GLOBAL WARMING USING AN ENERGY BALANCE GLOBAL CLIMATE MODEL. Fred J. Starheim and Thomas W. Schmidlin, Department of Geography, Kent State University, Kent, OH 44242**

The possibility of global warming due to the accumulation of greenhouse gases in the earth's atmosphere is an important ecological and economic issue facing contemporary society. Should dire warming predictions prove correct, dramatic environmental consequences, such as, major climate pattern changes and sea level increases are likely. Alternatively, minimal warming may produce only inconsequential environmental effects. While the preponderance of popular media coverage suggests that a dramatically warmer world is imminent, there is substantial disagreement within the scientific community over both the magnitude and timing of greenhouse gas-induced future climate change. In light of the uncertainty of the science and the resources at risk, much debate has focused on what should be the appropriate response strategies to reduce/stabilize greenhouse gas concentrations in the atmosphere. Proposals range from draconian measures costing trillions of dollars to the world economy to those which could be implemented at a low cost or even a net savings. This paper describes an evaluation of one such mitigative response strategy —that of large scale reforestation efforts to remove and sequester carbon dioxide from the atmosphere. The analysis is conducted using an energy balance/budget global climate model which is based on the original work of R. W. Pease in the *Annals of the AAG* (77:450-461). The model is a one-dimensional climate model with water vapor and albedo feedbacks. Results of this modeling technique suggest that the single mitigative approach of reforestation produces rather small temperature changes when compared to other forcing variables in the climate system.

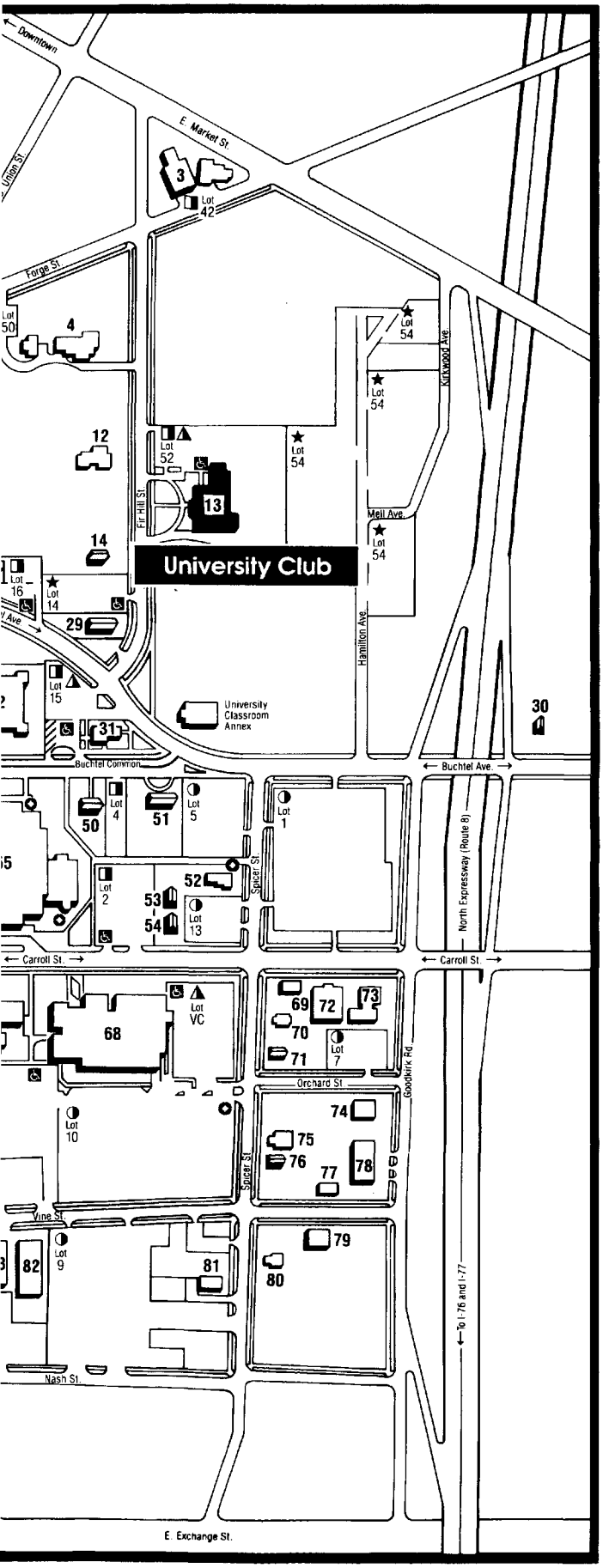
**9:15 WHALE CATCH FLUCTUATIONS IN ARCTIC AND ANTARCTIC SEAS: A GEOGRAPHICAL COMPARISON. John F. Wing and Donald J. Glazier, Wittenberg University, P.O. Box 720, Springfield, OH 45501.**

Long-term records for both polar regions were detrended and analyzed for periodicities using the contingency periodogram (Legendre et al, 1981). In the antarctic the evidence for cycles comes from McHugh's (1974) 52-yr records of overharvesting of Blue, Fin, Humpback, Sei and Sperm whales. Excluding the Sei, which ranges far north to feed, these species' residuals intercorrelate .48-.87 ($p<.01$). All show cycles ~24-yrs ($p<.05$); Sperm, Fin and Humpback show ~20-yrs ($p<.05$); and Sperm, Sei and Fin also show 9-12 yr cycles ($.10<p<.01$). Similar significant ($p<.05$) periodicities occur in the eastern Arctic for the Bowhead both in a 62-yr Dutch-German catch and 73-yr British-U.S. catch (Ross, 1979) spanning nearly two centuries. In the western arctic a 9-10 yr cycle ($p<.05$) appears in the Beaufort Sea but in the Chukchi Sea only a ~20-yr cycle ($p<.05$) occurs (Bockstoce, 1986). Both similarities and differences in cycles at the two poles are discussed in terms of effects of polar temperatures, precipitation, salinity and sea ice on both whale recruitment and catches.

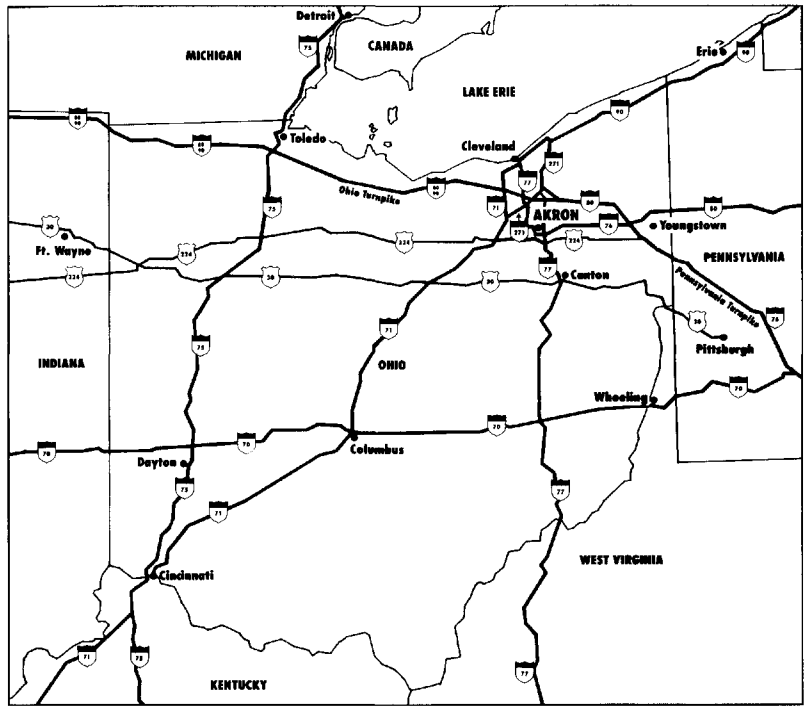
**9:30 WINTER SUB-FREEZING PERIODS AND MAJOR THAWS IN THE NORTHERN GREAT LAKES STATES. Rebecca A. Roethlisberger and Thomas W. Schmidlin. Department of Geography and Water Resources Institute, Kent State University, Kent, OH 44242-0001.**


Emergency Phones
Handicap Accessibility
Campus Buildings
Proposed Construction
Designated Parking Areas:
Visitors (metered)
Students
Faculty/Staff
All Permits
Handicap
Handicap Drop Off
Parking Decks
Reserved
Saturday, May 2 Sessions
College of Business Administration
Saturday Parking
All Academy Lecture
Polymer Science Building
Friday
Parking
Lot A
Friday, May 1 Symposia
Gardner Student Center
Quaker Square Hilton
State Vehicles
Basketball Court
Tennis
Lee R. Jackson Field
Buchtel Common
Downtown
E. Mill St.
S. Forge St.
E. Buchtel Ave.
University Ave.
E. State St.
E. Exchange St.
Carroll St.
Wolf Ledges Pkwy.
Buckeye St.
Summer St.
Union St.
Lincoln St.
S. College St.
S. Broadway St.
S. Main St.
S. High St.
Hill St.
Grant St.
Sherman St.
Wheeler St.
Arlyn St.
King St.
Brown St.
E. Cedar St.
To I-76 and I-77

# Y OF AKRON




## Major Highway Access Map




## Campus Building Legend

Admissions Building **31**
Alpha Delta Pi Sorority **80**
Alpha Gamma Delta Sorority **69**
Alpha Kappa Alpha Sorority **70**
Alpha Phi Alpha Fraternity **53**
Alpha Phi Sorority **16**
Auburn Science and Engineering Center **44**
Ayer Hall **45**
Ballet Center **3**
Bel-Aire Building **1**
Berns Residence Hall (privately owned) **78**
Bierce Library **33**
Boiler and Heating Plant **60**
285 S. Broadway Street Building **20**
277 S. Broadway Street Building **21**
Bookstore Annex **61**
Brown Street Residence Hall **84**
Buchtel Hall **58**
Buckingham Center for Continuing Education **23**
Bulger Residence Hall **35**
Carroll Hall **57**
Central Services Building **10**
Chi Omega Sorority **76**
College of Business Administration Building **22**
Computer Center **40**
Concord Residence Hall (privately owned) **91**
Crouse Hall **46**
Delta Gamma Sorority **51**
Delta Tau Delta Fraternity **30**
East Hall **28**
Electrical Substations **8** and **63**
Ellis House (privately owned) **93**
Exchange Building **86**
Exchange Parking Deck **64**
Folk Hall **89**
Forge Building **11**
Gallucci Hall **88**
Gardner Student Center **59**
Garson Residence Hall **95**
Gladwin Hall **42**
Glenville Residence Hall (privately owned) **74**
Graduate School and Research Services **29**
Grant Residence Center High-rise **90**
Grounds Maintenance **6**
Guzzetta Hall **25**
Health Services **26**
Hower House **4**
Joey Residence Hall (privately owned) **83**
Judson House (privately owned) **96**
Kappa Kappa Gamma Sorority **71**
Knight Chemical Laboratory **41**
Kolbe Hall **49**
Lambda Chi Alpha Fraternity **12**
Leigh Hall **48**
100 Lincoln Street Building **5**
McDowell Law Center **24**
Memorial Hall **56**
225 E. Mill Street Building **2**
North Hall **9a**
Ocasek Natatorium **68**
Olin Hall **32**
Olson Research Center **7**
Orr Residence Hall **27**
Phi Delta Theta Fraternity **52**
Phi Gamma Delta Fraternity **75**
Phi Kappa Psi Fraternity **81**
Phi Kappa Tau Fraternity **50**
Phi Sigma Kappa Fraternity **73**
Physical Facilities Operations Center **9**
Pi Kappa Epsilon Fraternity **79**
Polsky's Building **18**
Polymer Science Building **38**
James A. Rhodes Health and Physical Education Building **55**
Ritchie Residence Hall **34**
Robertson Dining Hall **26**
Schrank Hall N. **66**
Schrank Hall S. **65**
Sherman Residence Hall (privately owned) **92**
Sigma Nu Fraternity **72**
Sigma Tau Gamma Fraternity **54**
Simmons Hall **62**
Sisler/McFawn Residence Hall **37**
Spanton Residence Hall **36**
Spicer Hall **67**
Sumner Residence Hall (privately owned) **94**
Tau Kappa Epsilon Fraternity **14**
Theta Chi Fraternity **77**
E.J. Thomas Performing Arts Hall **17**
Town Houses (East Crown) **87**
The University Club of Akron **13**
143 Union Street Building **15**
Wallaby Residence Hall (privately owned) **85**
Wallaroo Residence Hall (privately owned) **82**
West Campus Parking Deck **19**
West Hall **39**
Whitby Hall **43**
Zook Hall **47**

Winter snow packs are an important environmental feature for wildlife, insects and the soil. Periods of winter freeze and thaw alter the physical characteristics of the snow pack important for the movement, distribution and health of animals. This research addresses the climatology of the longest subfreezing period in winter and the frequency of major thaws (>10° C) in the northern Great Lakes states of Michigan, Minnesota and Wisconsin. Data from 36 stations are used for the period spanning 1960 to 1988. The median length of the longest period below 0°C ranges from 20 to 44 days. There is a great amount of variation over short distances along the eastern Michigan shoreline and near Lake Superior. The annual probability of a major winter thaw during January ranges from 28% in the southern most extent of the study area to 0% in the northern region. The mean date for the first major thaw ranges from 12 February to 30 March. Statistical properties of the data frequency distributions are described, variables are mapped, regional patterns discussed and implications for organisms affected by the snowpack noted.

**9:45 USING COLOR INFRARED PHOTOGRAPHY TO FACILITATE A LOCAL LAND USE ANALYSIS. Maryann Clark. Department of Geography and Planning, The University of Toledo, 2801 West Bancroft Street, Toledo, OH 43606.**

This paper examines a one square mile site in Toledo including the Medical College of Ohio campus. The campus along with a nearby abandoned industrial site combine to provide a fascinating geographical study area especially given their location in an environmentally sensitive area. A high resolution color infrared photograph (CIR) serves as the primary data source. The scale of the photo was unknown but calculated to be 1:62500 using a 7.5 minute topographic map as a reference. Various land uses appear on the CIR photo based on their ability to reflect infrared radiation. A false color format allows the easy identification and comparison of land use polygons within the 640 acre study area. For example, bare soil emits high levels of red and infrared radiation and clearly shows up as red on the photograph. Wet soils and water appear much darker allowing researchers to measure local and seasonal site specific differences. This paper describes how such an analysis leads to a better geographical understanding of urban sites.

**10:00 OVERLAY ZONING AND THE DOWNTOWN PLAN FOR TOLEDO, OHIO. Beverlyann Dooley, Dept. of Geography and Planning, University of Toledo, Toledo, OH 43606.**

Toledo, like other midwestern industrial cities, is caught in the throes of a downward cycle of urban and economic decline. Over the last decade, the city lost over 25,000 people and inherited an excess of 13,000 vacant and abandoned housing units. Downtown employment has also declined from 21,000 in 1980 to 17,000 in 1990. Downtown office vacancy rates continue to be high, 21.7% compared to an average of 9.7% in 1987. This paper will review recommendations outlined in a recently drafted downtown strategic plan which incorporates the notion of a Downtown Overlay District as part of a revitalization effort. A photographic analysis, based on studies by William H. Whyte, will depict the typical problems and unique qualities the city possesses. Appropriate suggestions will be made for future programs.

**10:15 A REPORT ON AN EFFORT TO DEFINE AND LOCATE A NORTHWEST OHIO PLANNING REGION. Henry Moon, Department of Geography and Planning, The University of Toledo, 2801 West Bancroft, Toledo, OH 43606.**

The Toledo Metropolitan Area Council of Governments (TMACOG) is the officially designated regional planning agency for part of Northwest Ohio. TMACOG represents a voluntary collaboration of local governments and institutions and is responsible for regional transportation, environmental, and economic development planning. Since its inception in the 1960s, the agency has struggled with a variety of multi-scale issues across a plethora of regional and even state boundaries. At its 1989 Strategic Planning Session TMACOG identified a set of three immediate planning objectives. They were to 1) define and locate the planning region, 2) identify a list of regional environmental issues, and 3) examine the long-term potential of regional tax sharing. A task force was established to address each objective. This paper examines the efforts of the group charged with the regional scope of the agency. At its initial meeting, the twelve member task force identified a set of more specific objectives: to define or redefine Northwest Ohio, to identify ways to create positive attitudes toward the region, and to outline an enhanced regional planning process. Over the next year and a half the task force met nine times examining a host of regional boundary, political, and geographical issues. Members eventually agreed to define Northwest Ohio as a flexible functional region for planning purposes then outlined a strategy to address this "new" territory.

**10:30 PENT ROOFS AND DECORATED DOORS: EXPLORING THE BARNS OF THE EASTERN MIDWEST. Allen G. Noble, Department of Geography, The University of Akron, Akron, OH 44325-5005.**

In a large area across northern Ohio, and adjacent Indiana and southern Michigan, English and Raised barns predominate. These barns are basically like those found in other parts of the Midwest and northeast United States. However, two features distinguish these barns from other similar barns- (1) a pent roof added either to the gable-end or to the side of the structure, and (2) a prominent scheme of decorating doors in contrasting color to that of the rest of the barn. The extent of each of these features is mapped in northwestern Ohio and neighboring states and their relationship to ethnic groups is investigated.

**10:45 POST OFFICE TOWNS IN NORTHEASTERN OHIO, 1795 TO 1855: THE MAIL SERVICE'S ROLL IN THE CREATION OF FOCAL POINTS IN THE SETTLEMENT PATTERN. Alexander T. Bobersky, 646 Tod Ave. N.W., Warren, OH 44485**

The earliest hamlets, selected for their favorable sites, were scattered over a nearly undifferentiated territory and handicapped by the primitive condition of land transport. Any settlement, striving to prosper and overcome the limitations of situation tried to improve connections to the east coast. Mail service offered the only scheduled means of contact with the outside world. Any place lucky enough to get on a postal route benefited from the increased flow of goods and merchandise. The roads used by the mail service connected post office towns with the developing web of urban places. Postal service influenced which points on the map became trade centers. Post office towns grew larger than their neighbors but remained only locally significant. The number of towns with a post office increased over time and reduced the initial advantage of mail service. A post office could confer a temporary superiority over rivals but additional economic agents were necessary to gain higher order status. Other towns managed to secure a post office only to stagnate. Some post office towns lost their service to other places or even faded away. Without a post office it was far harder to get on the map. Mail service helped shape the countryside by encouraging the growth of focal points.

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## F. Geography
## Only Afternoon & Business Mtg.
## 1:30 pm, Saturday, May 2, 1992
## College of Business Administration 134
## Alex Bobersky, Presiding

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**2:00 THE CHANGING STATUS OF GEOGRAPHY AND THE SOCIAL SCIENCES AT STATE-ASSISTED UNIVERSITIES IN OHIO. Joseph Spinelli. Department of Geography, Bowling Green State University, Bowling Green, OH 43403**

This paper examines the changing status of Geography as a social science at state-assisted universities in Ohio using data from OBOR for selected years over the past two decades. There has been a shift in the importance of Geography as a major chosen by undergraduates, as one of several choices made among the various social science disciplines. There has also been a rearranging of universities as far as their ranking regarding the percentage of students choosing Geography over the other social science disciplines. Other variables are examined, such as sex and racial composition of the schools, total undergraduate enrollment, and proportion of out-of-state students.

**2:15 RIVERBOAT GAMBLING: WAGERING ON CHANGING THE GEOGRAPHY OF U.S. TOURISM AND GAMBLING. Jeffrey J. Gordon, Department of Geography, Bowling Green State University, Bowling Green, OH 43403.**

Several Mississippi River towns in Iowa instituted riverboat gambling early in 1991. This blend of nostalgic paddle-wheelers and gambling is an innovative attempt to increase tourism and, thus, economic revenues. Gambling, among the fastest growing industries in the U.S., is expected to generate $278 billion with profits of $26 billion in 1991. Thus far, the four gambling operations have proven successful in terms of new jobs created, gambling taxes received, and increased tourism. Other Mississippi River states including Illinois, Missouri, Mississippi, and Louisiana are already

engaged in various stages of legislative consideration and approval to emulate Iowa's fledgling riverboat gambling industry. In addition, some other states with navigable rivers such as Indiana and Pennsylvania are, likewise, contemplating similar floating casinos. If riverboat gambling should prove successful in the long run, its pull could well cause the geography of tourism and gambling in the U.S. to change.

**2:30 FACTOR ANALYSIS OF ECONOMIC AND DEMOGRAPHIC VARIABLES OF OHIO COUNTIES. Richard W. Janson, Geography Department. Kent State University, Kent, OH 44242.**

Economic data for the 88 counties of Ohio were subjected to a factor analysis in order to determine fine structure of the five economic subregions (NE, NW, SW, SE, Central). The primary purpose of the analysis was to discover generalizations characteristic of Ohio counties by using commonalities in attribute vectors to generate a few fundamental factors. The five subregions have an average area that exceeds 8000 square miles, and wide disparities in spatial variables are the norm. Subregions are discussed within the context of the factor analysis. The method allows determination of growth poles within the subregions. defined at a county level of aggregation, and also allows categorization by other factors. Factor loadings on each variable dimension are also reported.

**2:45 THE OHIO STATE UNIVERSITY EXTENSION SERVICES' TAKE CHARGE PROGRAM. Hans D. Rosebrock, The Ohio State University Extension Service, 225 Underwood Street, Zanesville, Ohio. Jerold R. Thomas, The Ohio State University Extension Service, 112 E. Mansfield Street, Bucyrus, OH 44820**

In today's global economy, informed community leaders are a must for a successful economic development program. To help communities deal with this dilemma, The Ohio State University Extension Service has developed a proactive geographical education program entitled "Take Charge Empowering Local Communities for Economic Development in the 1990's." The program helps communities understand its socio-economic profile, its comparative advantage, the resources available, and aids in choosing the appropriate economic development strategies.
The paper will explain the Take Charge Program, and analyze the results from programs conducted in two Ohio counties.

**3:00 ECONOMIC DIVERSIFICATION LEVELS OF OHIO COUNTIES Jerold R. Thomas, The Ohio State University Extension Service, 112 E. Mansfield Street, Bucyrus, OH 44820**

Economic diversification is often viewed as a positive economic development strategy for local communities. By having a diversified economic base, communities can better weather downturns in economic cycles. As one industry suffers a slow down, another may be experiencing growth. Thus a community may sustain stable employment levels.
This paper explores diversification levels in Ohio counties in 1964 and 1986. Rural, suburban, and urban counties are examined for diversification differences by county types. Severity measures will also be investigated in an attempt to view how well diversified counties are doing relative to non-diversified counties.

**3:15 ASSESSING THE EFFECTS OF OUTSOURCING ON MANUFACTURING EMPLOYMENT. Shawn Ferguson. Department of Geography and Planning, The University of Toledo, 2801 West Bancroft Street, Toledo, OH 43606.**

This paper examines the effects outsourcing of business and professional services has on manufacturing employment. The study area encompasses Lucas County and its hinterland. As manufacturers continue to outsource such services, new opportunities for development of subdivisions in the service industry are occurring. Identification of industries with potential for growth was conducted. From that list of growth industries we examined various strategies to retain, expand, and attract them to the area. This necessarily includes financing, locational analysis, and market identification. Recommendations are oriented toward public sector economic development interests and private sector firms and analysts.

**3:45 STRANGERS IN THE NIGHT: GEOGRAPHERS AND FREEDOM HOUSE. Thomas D. Anderson, Department of Geography, Bowling Green State University, Bowling Green, OH 43403.**

Freedom House is a nonprofit organization based in New York City. Formed in 1941 as a citizen response to the spread of totalitarianism it has maintained a global outlook and expanded its facilities over the past half century. Its continuing concern with human conditions in all countries makes its publications useful to geographers. This paper has two objectives. It reviews information assembled and disseminated by Freedom House as to its value to geographers and examines the perplexing lack of interest by many geographers in its contributions. *Freedom in the World* has been published annually since 1978 and provides current details and assessments for every country and political dependency as well as invited commentary on contemporary issues. Yet the book has been ignored by review editors at our profession's leading journals. No clear explanation for this discrepancy is identified but several are offered. The paper closes with the admonishment that an end to the general estrangement would benefit geography.

**4:00 MODIFIED WEALTH SYMBOLS AS AN ALTERNATIVE TO POLITICAL SYSTEMS AND AS AN ANSWER TO ARROW'S PARADOX. William H. Mook, Jr. 9124 Leith Dr. Dublin, OH 43017**

All governments now spend resources beyond economically sustainable rates. According to Schumpeter (1917) excessive spending gives rise to intense inflationary pressures. Clark (1938) anticipates strong supression of industrial economic activity. Both predict destruction of political systems which sustain high levels of spending. Those spending most suffer first, but all are at risk since all now spend beyond the limits set by Schumpeter and Clark. It is therefore reasonable to ask, What will replace existing forms of government when they all have failed? Arrow (1951) proved that democratic as well as dictatorial regime were both subject to manipulation. (Non-transitive paradox) Modification of existing symbols of wealth from scalar form to vector form are proved to permit the expression of political will in a 'political marketplace' while avoiding Arrow's Paradox, and maintaining levels of representation sought, but not achieved, by democratic systems.

**4:15 DEMOCRACY IN CHINA: PROSPECT FOR CHANGE. Stephen S. Chang, Department of Geography, Bowling Green State University, Bowling Green, OH 43403.**

Discussion regarding the prospects of democratic changes in China has been common since the Tiananmen Square incident in June, 1989. Much of this discussion is a gross generalization of the Tiananmen Square demonstration and lacking in historical and geographic perspective.
The Confucian concept of state which governed China for thousands of years operates differently from the democratic one. Most people in China have little concept of democracy. The seemingly impressive numbers of Tiananmen Square demonstrators represented only a small percentage of the total population and were primary urban residents. Most of the population are rural and not involved. Historically, successful changes had to have rural support and participation. Throughout Chinese history, dynastic changes were preceded by the gradual weakening of centralized control. At present, provinces are gaining economic power and independence. Changes to democracy have to be through an evolutionary process. The alternative, much feared by the Chinese, is chaos and instability. External pressures can only have very marginal impact given the recent history of humiliation and domination by Western countries.

**4:30 PROVISIONAL CENSUS OF INDIA, 1991. Dr. Ashok K. Dutt, Professor, Geography and Urban Studies, The University of Akron, Akron, OH 44325; Anindita Sen, Ph.D. Student, University of Akron.**

A preliminary analysis of 1981-91 growth rate and its relation with female literacy has been made based on the data published by the Census of India: Provisional Population Totals, April, 1991 issue. Kerala and Tamilnadu have the lowest population growth rates in both decennial periods 1971-81 and 1981-91. Nagaland and Delhi are the fastest growing areas. There is a significant difference in the country's male and female literacy rate. Kerala ranks first in the country both in male and female literacy. Population growth and female literacy are interrelated in some instances. Kerala, Tamilnadu and Goa have relatively higher female literacy rates coupled with lower growth rates of population. On the other hand, Nagaland, Mizoram, Delhi and Chandigarh have high female literacy rates along with a high proportion of growth rate. Scattergrams are provided to help explain the above characteristics.

**4:45 DEMOGRAPHICS OF HIV INFECTION IN THE MAJOR U.S. CITIES. Vijayalaxmi Juvva; Ashok K.Dutt; Hongmian Kong; and Hiran Dutta; The University of Akron, Akron, OH 44325.**

HIV infection continues to be a disease of large cities in the U.S. We determined the patient demographics of 94 Metropolitan Statistical Areas(MSAs) and evaluated the correlation of this disease to patient groupings, age, race, and gender. Cluster analysis revealed that there is a

significant pattern between patient demographics of larger and smaller MSAs. 60% of all HIV victims are due to homosexual/bisexual contact. (San Francisco 84%, St.Louis 79% - The patient population being predominantly white compares to NY City 45% and Miami 44% - where the patient population being predominantly blacks and hispanics). Data analysis also reveal that very large MSAs have a significant presence of pediatric HIV infection and smaller MSAs have heterosexual contact as the major risk factor. Our analysis concluded a significant pattern among patient groupings, age, race, and gender for HIV infection.

## G. Chemistry
## Only Afternoon & Business Meeting
## 1:30 pm, Saturday, May 2, 1992
## College of Business Administration 259
## James Ferguson, Presiding

**2:00 RUTHENIUM(II) CATALYZED CYCLIZATION OF CHLORINATED N-ALLYL ACYLSULFONAMIDES. Greg A. Slough, Michael Rachita. Department of Chemistry, The College of Wooster, Wooster, OH 44691.**

Recently, the transition metal catalyzed Kharasch reaction has emerged as an important new carbon-carbon bond-forming reaction. A variety of cyclic and bicyclic acids, esters and nitriles have been prepared by this method. We have extended the scope of this reaction by studying the ruthenium(II), $[Ph_3P)_3RuCl_2]$, catalyzed cyclization of 2,2-dichloro- and 2,2,2-trichloro-acetyl-N-allylphenylsulfonamides. These reactions occur at lower temperatures than other metal catalyzed Kharasch reactions and produce 2-pyrrolidinones exclusively. We have identified two substituent effects associated with this reaction. Bulky alkyl substituents located at C-2 of the acylsulfonamide eliminates reductive dechlorination processes and excellent simple diastereoselectivity (>15:1 *cis:trans*) is observed in all pyrrolidinone products. Para substituents on the phenylsulfonyl group have a dramatic influence on the reaction rate. Electron-donating substituents retard the reaction, while withdrawing substituents accelerate the reaction. For example, substituents such as chloride, hydrogen, methyl, and methoxy have half-lives of 15, 60,180, 360 minutes, respectively. Both substituent effects are best understood in terms of a chelated radical pair as the reactive intermediate.

**2:15 THE CATALYTIC TRANSFER HYDROGENATION OF BENZALDEHYDE IN A MICROWAVE OVEN. Edward M. Gordon, Dawne Zacharias and Kimberly Jebber. Department of Chemistry, Baldwin-Wallace College, Berea, OH 44017.**

The catalytic transfer hydrogenation of benzaldehyde using formic acid as the hydrogen donor molecule and carbonylchlorohydridotris (triphenylphosphine)ruthenium(II) as the catalyst was carried out in a Samsung MW5510 household microwave oven. The yields of the primary product benzyl alcohol and the secondary product benzyl formate were compared with those produced by heating the reaction mixture to reflux with a heating mantle over time frames of 10 minutes to 3 hours. The reactions were carried out without solvent with benzaldehyde to catalyst and formic acid to catalyst mole ratios of 781 and $1.76 \times 10^3$ respectively. The comparison indicates that carrying out the reaction in a microwave oven produces a rate enhancement. For example, after 10 minutes of microwave heating, 19% of the benzaldehyde had been hydrogenated as compared with only 6% under reflux. This corresponds to average turnover rates of $8.9 \times 10^2$ turnovers/hr for the microwave reaction and $2.8 \times 10^2$ turnovers/hr for the reflux reaction.

**2:30 MECHANISTIC STUDY OF THE POLYOL PATHWAY. Mary Ellen Scott and Ronald E. Viola. Department of Chemistry, University of Akron, Akron, OH 44325-3601 .**

Many forms of diabetes can be treated, however, complications from diabetes remain the third highest cause of death in the United States. Among the potential serious complications are blindness, cardiovascular disease and kidney failure. The symptoms may occur as a consequence of some abnormalities in carbohydrate metabolism. In particular, the polyol metabolic pathway and the levels of the metabolic intermediate *sorbitol* have been implicated. An examination of the structure and specificity of the two enzymes that catalyze the metabolic interconversions in this pathway, *aldose reductase* and *sorbitol dehydrogenase*, will be presented. Through the use of alternative structures, specifically fluorosugars and deoxy sugars, the mapping of the active site of both enzymes has been probed using classical kinetics and molecular modeling studies. The results of the studies are being used to ascertain how each of the enzymes interact with their substrates.

**3:00 MECHANISM-BASED INACTIVATOR AND ALTERNATIVE SUBSTRATE FOR L-ASPARTASE. John F. Schindler and Ronald E. Viola, Department of Chemistry, University of Akron, Akron, OH 44325.**

The enzyme L-aspartase has been shown to be absolutely specific for only L-aspartic acid. However, in studies using a site-specific analogue, observations suggest that a possible alternative substrate does exist. L-aspartase is irreversibly inactivted by L-aspartic-ß-semialdehyde (L-ASA). Preliminary studies have indicated that L-ASA is processed by the enzyme to produce fumaric semialdehyde (FAA), which may be responsible for the inactivation of L-aspartase. Complete protection against L-ASA inactivation is seen with fumarate and $Mg^{2+}$, which, from previous binding studies, suggest that L-ASA may be acting as an activator for the enzyme. Recently, FAA has been synthesized from methylcrotonate. Protection studies against FAA inactivation show that when α-methyl-DL-aspartate (AMA), an activator for the enzyme, and $Mg^{2+}$ are present the rate of inactivation increases. Complete protection is seen with fumarate, AMA, and $Mg^{2+}$. Complete protection is also observed when AMA is replaced with L-ASA. This clearly suggests that L-ASA is also acting as an activator for the enzyme. The rate of inactivation for both L-ASA and FAA increases, with increasing pH. No inactivation is observed for either L-ASA or FAA below neutral pH. There is, however, evidence that an enzyme-catalyzed reaction is taking place with L-ASA, and in the reverse direction, with FAA.

**3:30 SITE SPECIFIC MUTAGENESIS OF L-ASPARTASE FROM *E.COLI*. A. Sami Saribas and Ronald E. Viola, Department of Chemistry, University of Akron, Akron OH 44325.**

L-aspartase is a bacterial enzyme that seems, from sequence homology studies, to belong to a family of enzymes which includes the fumarases and argininosuccinases. Chemical modification and kinetic studies in our laboratory have indicated that the enzyme contains functionally important cysteine and lysine residues [Karsten & Viola, *Arch. Biochem. Biophys.* **287**, 60 (1991)]. Sequence comparisons within this enzyme family have indicated that **lys-326** is located in highly conserved region of these enzymes, whereas **cys-389** is found in the conserved region of aspartases and fumarases. **Cys-389** and **lys-326** have been altered using site specific mutagenesis to investigate their potential role in enzymatic activity. Mutation of **cys-389** to **ser-389** resulted in no change in L-aspartase activity, suggesting that this residue is not important for the catalytic action of L-aspartase. However, mutation of the more strictly conserved residue **lys-326** to **arg-326** resulted in dramatic changes in the enzyme. The **K326R** mutant has only 0.8% of the maximum velocity of the wild type and the turnover number for the mutant is 2000 times lower than the wild type. These studies are beginning to define the active site structure of L-aspartase. Supported by a NIH grant (GM 34542) to R.E.V.

**4:00 Trend Analysis in the Formation of Induced Nematic Phases in Binary Mixtures using Artificial Neural Networks. Khin M. Yin. Kent State University, Trumbull Campus, 4314 Mahoning Ave. N.W., Warren, OH 44483**

The liquid crystal properties of a variety of 4-halophenyl-4'-alkoxybenzoates and 4-alkoxyphenyl-4'halobenzoates along with the phase diagrams of the binary mixtures are reported in the literature. The phase diagrams show that the liquid crystal phase transitions temperatures: that is, the melting temperatures, the smectic to smectic transition temperatures and the nematic to isotropic transition temperatures, seem to show qualitative similarities. The values of the transition temperatures also vary depending on the molecular groups within the liquid crystal molecules. Artificial neural nets are useful tools for chemical synthesis and fabrication. With appropriate representations of the molecular and phase properties, these neural nets can be applied to liquid crystal studies. For our liquid crystal studies, we trained a few neural nets with and without optimization, to learn some of these liquid crystal phase diagrams. Then, these trained neural nets were asked to predict the phase diagrams of similar groups of the liquid crystal mixtures. The neural net predictions are qualitatively good, although some features of the binary mixtures are not predicted. This paper presents the training of the neural nets, the results obtained and directions for further studies.

## G. Chemistry
## Poster Session
## Saturday, May 2, 1992
## College of Business Administration Concourse

**BOARD J**

**2:00 THE SEARCH FOR STRUCTURAL MOTIFS IN FUNCTIONALLY RELATED PROTEINS. Philip V. Patete and Ronald E. Viola, Department of Chemistry, University of Akron, Akron, OH 44325**

A set of computer programs have been written to be used to search for common structural motifs in proteins. Many different proteins have been examined including the enzyme L-aspartase and other sequence-related enzymes, and also various calcium utilizing proteins. Programs written in our lab as well as programs written by other researchers were used to examine these different proteins with the primary goal being to determine if there is any common homology between these families of proteins. These homologous regions are then searched in an attempt to identify some fuctionally relevant motifs. This was accomplished by first analyzing the protein sequence of interest by comparing it to different databases of protein sequences. Once an area of common homology was found, the protein of interest and the area of homology were examined using computer modelling techniques to search for structural features from the Brookhaven Protein Data Bank. The results of these investigations on these families of proteins are presented.

## H. Science Education
## First Morning
## 9:00 am, Saturday May 2, 1992
## College of Business Administration 130
## Spencer E. Reames, Presiding

**9:00 TEACHING STUDENTS HOW TO LEARN—A PILOT COURSE: TECHNIQUES OF SCIENTIFIC RESEARCH Claudia Khourey-Bowers, Canton McKinley Sr. High School 2323 17th St. N.W., Canton, OH 44708**

Our primary goal in establishing this course was to keep our talented students actively involved in the science curriculum. We felt that our students needed to develop an understanding and appreciation for the rigors of scientific research. We also believed that we could kindle new interest by offering a highly personalized, integrative course such as this. The course was designed as a series of teacher-guided classroom presentations incorporating assignments that would lead students in the mastery of standard methods of research in environmental sciences. These methods included choosing a problem. conducting library research, making personal contacts with practicing professionals, developing experimental design, practicing data collection techniques, and summarizing and interpreting results. The group project was an environmental survey of inflow and outflow streams in the Atwood Reservoir region of Ohio. Many flaws in the research design and preparation became apparent during the class's analysis of the collected samples. As a learning experience the project was very fruitful for both students and teachers. Overall, our goals for improving student involvement and personalizing science were accomplished. The students developed a realistic view of the requirements of conducting good research. They also developed more sophisticated attitudes about bioethics through literature searches. In the next session of the course, modifications in the curriculum will be incorporated to correct weaknesses in the pilot program.

**9:30 HOW TO FOSTER INNOVATING, C.A. Hilgartner, Hilgartner & Associates, 254 Kensington Place, Marion, OH 43302, Theodore L. Miller, Department of Chemistry, Ohio Wesleyan University, 61 Sandusky Street, Delaware, OH 43015**

The structure of TLM's chemstry courses has evolved into what he now calls a demonstration—exploration—discussion format. The classroom becomes a place in which to explore and evaluate, to create and synthesize, and to cover material brought up by student questions and needs. Overall, the content of these courses matches that of most other chemistry courses. However, the setting for learning is different; inquiry becomes more important than answers. The transactions between the instructor and students foster the development of problem-solving skills and critical thinking. As the students learn a specific body of information, they experience working in a milieu of cooperation. On standardized tests, the 96 students in these innovative courses scored in the 68th percentile rank, higher than the average score of TLM's past 456 students by 14 points. The comprehensive theory of human behavior which CAH has developed allows us to account for the above findings in rigorous theoretical terms. In this paper we briefly develop the relevant constructs concerning social systems, and use them to explore the hypothesis that the usual, more authoritarian ways of teaching science leads students to become more subservient to authority and disposed to think in conformist, tradition-bound ways; while the demonstration—exploration—discussion format, with other non-authoritarian ways of teaching, leads students to become more innovative and creative, more likely to dare to think, see and feel for themselves, and to develop a stronger sense of attitudinal well-being. They behave more like scientists.

**10:30 A REPORT ON THE NATIONAL BIOTECHNOLOGY SHARING CONFERENCE. Spencer E. Reames, Assistant Project Director Biotechnology, The Ohio Academy of Science, 1500 W. Third Ave. Suite 223, Columbus OH 43212 and Michael Patrick, Conference Chair, University of Wisconsin, Dept. of Genetics, Room 104, Genetics Bldg., Madison, WI 53706.**

The National Biotechnology Education Sharing Conference was held October 28-30, 1991 at the University of Wisconsin in Madison. The conference was sponsored by the National Science Foundation, The University of Wisconsin, and several private biotechnology companies. The Conferees represented the private sector, university scientists, and secondary teachers. The goal of the conference was to give direction to biotechnology education in this country. Proceedings of the conference will be published in early 1992. The conference was organized into working groups and some important recommendations came out of these working groups. They were (1) that biotechnology ought to be integrated into the curriculum and not taught as a separate unit (2) that we ought to broaden our perspective on what biotechnology is (at the present time, most of the emphasis in on DNA science) (3) and for biotechnology educational efforts to be successful there needs to be a greater working relationship between universities, schools, and industry. Other recommendations from the conference will be discussed during this presentation.

**10:00 HANDS-ON BIOTECHNOLOGY ACTIVITIES FOR GENERAL OR ADVANCED BIOLOGY STUDENTS. Ed Corley, Eaton High School, 307 North Cherry Street, Eaton, OH 45320.**

Many teachers don't incorporate biotechnology into their biology classes because it is perceived as being either too expensive, too difficult to comprehend, or both. This session will demonstrate a variety of activities and methods to have you and your students doing biotechnology activities, regardless of your budget or perceived lack of expertise. Areas that will be covered include: low-cost alternatives to "high tech" equipment; good pre-packaged biotechnology activities from various biological suppliers; exactly what level of expertise is really required to do biotechnology activities; sources of biotechnology activities and information; and, samples of biotechnology activities that simulate and explore the processes involved but don't require expensive lab equipment.

The author wishes to acknowledge support for some of his biotechnology activities from the Martha Holden Jennings Foundation in the form of a Grant-To-Teachers Grant (# C-3-91 ) .

## H. Science Education
## Second Morning
## 9:00 am, Saturday, May 2, 1992
## College of Business Administration 138
## Connie Hubbard, Presiding

**9:00 OHIO BOARD OF REGENTS ACADEMIC CHALLENGE PROGRAM AT KENT-ASHTABULA: SCIENCE AND MATHEMATICS ENHANCEMENT. Roger L. Lane, Kent State University, Ashtabula Campus, Ashtabula, OH 44004.**

Science/Mathematics Enhancement at the Ashtabula Campus of Kent State University was funded from 1 July 1985, to 30 June 1991. Total funding was for $324,738. The specific intent of this program was to increase freshman enrollment in science and mathematics, thereby increasing the number of sophomore-level students at the campus. To accomplish this goal new equipment was purchased for the laboratories, computers were provided for student use, up-to-date audio-visual materials were purchased, the library holdings were increased, and, most particularly, course offerings were guaranteed. For safety and aesthetics, some minor laboratory and lecture room renovation was done. In four years the number of freshman and sophomore students more than doubled in all programs except physics. A science lecture series was instituted to promote science to the general public. Speakers in biology, chemistry, geology, and physics attracted an average audience of about fifty people. Outside evaluations were done by individuals representing the American Chemistry Society and the National Association of Biology Teachers.

**9:15 BUCKEYE WOMEN IN SCIENCE, ENGINEERING AND RESEARCH. Elizabeth Obara, Dr. Lois Cook, Carol Damian, Connie Hubbard, 6321 Riverside Dr. Powell, OH 43065.**

Young girls and boys have similar achievement scores in mathematics and science until seventh grade, when the girls' scores drop dramatically. This is thought to be because of the macho image they perceive about these courses and their own lack of self confidence about the so called tough subjects. The result of this misguided information is that girls in general choose not to take science and mathematics courses in high school and college. This disastrous short fall of intellect will see the United States short 675,000 scientists in the next ten years. (*Science*, Vol. 244, pages 1536-1537, June 30, 1989.) B-WISER Camp (Buckeye Women in Science, Engineering and Research) is taking a big step forward in alleviating this problem. Outstanding teachers have been chosen to teach physics, chemistry, earth science, computer science and research in high activity, "Gee Whiz, Wow" types of science for a week in the summer at Wooster College, Wooster, Ohio. The girls are active participants in "hands on" classes. Professional women examplars, chosen by The Ohio Academy of Science, will mentor each youngster throughout the year, helping her on a specific research project, which will be presented at a local science fair the following year.

**10:00 CURRICULUM ENHANCEMENT THROUGH COLLABORATION Carol Skinner, Department of Biology and Health Services, Edinboro University of PA, Edinboro, PA 16444 and Jim Parker, Stow High School, Stow, OH 44224**

Effective science education at the secondary level should provide students the opportunity to work with real data, regardless of whether they can personally collect it. The published literature represents a broad source of such data. Unfortunately, educators are often unable to utilize this source, owing to limited access, time constraints, or lack of knowledge of a specialized field. University faculty, however, maintain current knowledge of their fields and can provide curriculum enhancement for science teachers which incorporates recently published data and visual imagery. Professors often develop extensive slide libraries during the course of their research and travels. These materials can be used to enhance units on ecology and field methods. Our collaboration resulted in the preparation of three lesson plans in behavioral ecology using actual data to investigate topics of demography, taxonomy, and seasonality. Also, using slides taken in the field and during research, two lesson sets were prepared covering tropical rainforest flora and fauna, and the social behavior of Panamanian tamarins. This information was used in the high school classroom to train students in the application of data sets to hypothesis testing and scientific method, as well as to visually enhance the content of units on behavior and tropical ecosystem diversity.

**10:15 INTEGRATING SCIENCE AND TECHNOLOGY EDUCATION: MULTIPLE PERSPECTIVES ON A NEW HIGH SCHOOL COURSE IN WEST MUSKINGUM. Carolyn S. Carter, 249 Arps Hall, 1945 N. High St., Ohio State University, Columbus, OH 43210.**

In 1989 West Muskingum School District, in partnership with The Ohio State University, received a Dwight D. Eisenhower grant for development of an innovative integrated science and technology program for West Muskingum High School. Activities funded by the grant included curriculum conceptualization and planning, materials development, a series of science and technology field trips, a science coaching program. and the development of a new course to meet the District's science requirement. The hands-on activity-based course is being piloted during the 1991-1992 school year and materials are being revised as each section of the program is implemented. This paper will: 1) describe the integrated course; 2) provide examples of activities, curriculum materials and student products; 3) discuss the effects of the program on students in the pilot project; and 4) analyze program outcomes from the perspectives of the pilot program teacher, Maryanne Sauzuck, and the students Troy Alford, Jennifer Coffey, Lea Daniels, D.J. Glosser, Shawn Graham, and Lorie Newsom, and the Ohio State University team. The paper will also describe the preparation needed for teaching such a course, impacts of school organization and other practical issues in implementing innovative, activity-centered curricula in science and technology.

## H. Science Education
## First Afternoon & Business Mtg
## 1:30 pm, Saturday, May 2, 1992
## College of Business Administration 130
## Spencer E. Reames, Presiding

This presentation will be given during the Business Meeting of section H. Science Education.

**1:30 A PROPOSED ACADEMY PROJECT TO IMPROVE SCIENCE EDUCATION. R. Thomas Myers, Dept. of Chemistry, Kent State University, Kent, OH 44242.**

There is general agreement that science education can and should be improved. However, there seems to be no scientific approach to the basic questions: What should be taught? In what order? I propose that the O.A.S. establish a representative committee to address these questions, operating in two phases. (1) The first is to list basic concepts that everyone should know. (Other proposals can be used also). The concepts are then ranked in scientific priority, e.g., weight must precede buoyancy. (2) The committee is now expanded to include school teachers and experts in child development. The science concepts are now arranged in the order that children can absorb them. This will include both qualitative and quantitative aspects. It is assumed that all the while there will be an emphasis on how we learn, as well as what we learn.

**2:30 THE ROLE OF ACTIVE LEARNING IN INTRODUCTORY GEOLOGY. Christopher Kenah, Denison University, Granville, OH 43023**

The current fad in teaching is active learning. Geology and other sciences have used active learning in labs for decades. The question is whether or not it is useful to incorporate active learning into the lecture component of introductory geology courses. I have experimented with short, small group activities over the past two years and have concluded that active learning can be effective in lecture sessions. Active learning in geology entails handing a student or group of students a rock or picture and having them describe what they observe. These active exercises can be used to break up lecture periods. They also provide a means of incorporating short writing assignments and practicing small group interaction in lecture sessions. An example of an exercise that I use as a transition from igneous to sedimentary rocks involves passing out samples of conglomerate and asking what information texture and composition provide? This forces the students to use their observational skills and to consider the different environments for igneous and sedimentary rocks. These exercises take time and consequently as more active exercises are incorporated there is a loss of lecture content. I believe, however, that this loss is balanced by a greater understanding of the material that is covered.

**2:45 INCLUSION OF A HANDS-ON SESSION OF STATIC ELECTRIC CHARGES IN HIGH SCHOOL CHEMISTRY. Pei-Hsing L. Wu, Teacher Emeritus,Grandview Hts. High School,1587 W. 3rd Ave, Columbus OH 43212**

Chemical behavior of elements and their compounds are best treated by using the concept of chemical periodicity, which is in turn related to Coulomb's Law . Coulomb's Law states that there are forces exerting between charged particles. The force changes as the distance between the

charges changes. This presentation is to emphasize the benefit of having a hands-on session on static electricity in the chemistry class, prior to the study of atomic structure. In the session the students are to generate charges and study the behaviors of these charges with the help of an electroscope. Having observed these fundamental phenomena they will have some ideas on what causes the periodic variation in elements, such as atomic radius and their properties, such as ionic reactions. In essence, they are better prepared to interpret periodicity and properties using Coulomb's Law. Presented and distributed here are one procedure for building an eletroscope using recycled materials and one newly designed demo. Outcome of this hands-on will be discussed.

**3:15 MOONBASE AMERICA: USING SIMULATIONS TO DEVELOP STUDENT GROUP DYNAMICS FOR SUCCESSFUL PROBLEM-SOLVING.Carolyn Staudt and Christine Johnson, 3807 Ridgewood Road, Copley, OH 44321**

Typical classroom teaching—e.g., worksheets, lectures, etc.—focuses on basic learning skills and rarely addresses the students' need for higher-level learning. Even more rare is the classroom which teaches the necessary job skills of group dynamics and adaptability. The results of MOONBASE AMERICA indicate that holistic simulations—those which create an entire reality in which the students actually live and work—do succeed in teaching the higher-level skills of analysis, creative thinking, teamwork building, and most importantly, problem-solving. Another factor is the learning environment itself, wherein throughout a year-long study, school teachers are joined by corporate and community members to provide the students a strong curriculum, ensuring a successful, educational simulation. The ultimate result is a powerful, influential impact on the students, providing the basis for a lifelong appreciation of problem-solving and group dynamics.

**3:45 DEVELOPING COMPETENCIES FOR TECHNICAL WORK. Miles Free. 275 Rustic Rook, Chippewa Lake, OH 44215.**

Students entering into their first technical job have erroneous ideas about employer's expectations. Perfection, equipment-specific abilities, experience, and extensive knowledge in the field are not expected for entry level technical work. Employers expect abilities to learn based on first principles, continue learning by recording facts, and the ability to find reference information without coaching. Use of the computer for data entry, calculation, and communication through written reports and graphs is also essential. Teaching students how to manage information using the computer must be supplemented by the use of outlines, flowcharts, date and timestamping data, references in notes, and honesty regardless. Interpersonal skills such as teamwork, communication skills, and motivation are as valuable as the expected ability to use simple statistics- histograms, average, and standard deviation. The use of homework as a resource for taking tests is encouraged to teach students that maintaining a "solved problem file" is essential for successful and time effective technical work.

**4:00 MEDCAMP: A PARTICIPATORY EXPERIENCE IN THE LIFE SCIENCES. KEN S. ROSENTHAL, Ph.D., Northeastern Ohio Universities College of Medicine, Box 95, Rootstown, OH 44272**

**MEDCAMP** is a three day live-in experience modeled after NASA's SPACECAMP which provides students with hands-on learning through a problem-solving experience. The purpose of the program is to enhance students' self-efficacy and interest in the life sciences and a career in medicine. The pilot program was held in August, 1991. Students entering the ninth grade are enrolled in MEDCAMP and are titled Beginning Doctors (B.D.). On the first day, the B.D.s are introduced to clinical problem solving and analyze clinical case histories. On the second day, the B.Ds are responsible for developing the diagnosis for a clinical case. Physician mentors (Attendings) lead small groups through hands-on laboratories (microbiology, physical diagnosis, cardiology (EKG), and anatomy) and facilitate the analysis of the clinical data. On day three, the small groups of B.D.s present the data from one of the labs and another group provides an overview in a Clinical Grand Rounds format. The pilot program was a great success.

**4:15 DOE TEACHER OPPORTUNITIES James B. Short, 121 Wilson Dr.,Montpelier, OH 43543**

The Department of Energy sponsors a program for teachers to spend eight weeks at a national laboratory. Each teacher research associate(TRAC) is given the opportunity to work on a project with a research scientist. The Pacific Northwest Laboratory(PNL) is operated by Battelle in Richland, Washington. The site of PNL is on the edge of the Hanford Reservation, the location of much of the United States' enriched uranium and plutonium nuclear reactor experiments and a nuclear waste site. Battelle's mission at Hanford emphasizes:1. monitoring of nuclear and non-nuclear wastes, 2. developing new treatments for environmental hazards, 3. encouraging scientific research, and 4. aiding and encouraging education. The presenter participated in critiquing the Hanford Environmental Report for 1990, assisting and observing environmental sampling, and literature review for the study of risk. An educational game was developed to introduce an awareness of life's risks to students. Other lesson plans were developed to study variables influencing pollution movement. This presentation will include a discussion of the monitoring at Hanford, views of the Hanford site, slides of collection techniques, views of Washington's geology, an introduction of the developed lesson plans, and an explanation of the TRAC program.

## H. Science Education
## Second Afternoon
## 2:00 pm, Saturday, May 2, 1992
## College of Business Administration 138
## Richard Benz, Presiding

**2:30 THE DESIGN OF A COMPUTERIZED TUTORIAL TO TEACH MATHEMATICS TO NURSING STUDENTS. Nancy Barkley Aho, The University of Akron, College of Nursing, Akron, OH 44325-3703.**

Deficiencies in basic mathematical skills for nursing students has been a documented problem in nursing programs across the nation. Computer-assisted instruction can be used as an effective and efficient tool to facilitate mathematics instruction. Principles from instructional-design theory and problem-solving in mathematics were used as a basis for designing two computerized tutorials to teach a mathematics problem in nursing. Thought-provoking questions were added to one of the tutorials to further stimulate cognitive processing by the student. The effect of the additional thought-provoking questions on student learning was the focus of this investigation. Approximately seventy nursing students were given an initial mathematics calculation test to provide an individual baseline, followed by one of the tutorials and a posttest. The completed results and design implications of this study will be discussed. Student comments during data collection were positive.

**2:45 BUSINESS EDUCATION ALLIANCE REACHES SCHOOLS: A MODEL FOR TEACHING ECONOMICS TO SIXTH GRADERS. Pearlmarie W. Goddard, Rebecca S. Turner, College of Education, The University of Akron, Akron, OH 44325-4201.**

The BEARS (Business Education Alliance Reaches Schools) project is designed to enhance sixth graders' economic learnings by demonstrating the relevancy of skills and knowledges taught in school as they are applied to simulated work situations. This collaborative economic project involves personnel from an Akron middle school, GenCorp, and The University of Akron College of Education. The project is in its third year. The data collected over the past two-year period indicated a positive difference was made with the pilot groups not only with understanding economic concepts, but with school attendance, homework responsibilities, and self esteem. Quantitative and qualitative statistical techniques were applied. In order to meet the goals of the project, three mini-corporations were developed in the classroom. Activities included career exploration, job interviews, jobs, and job training. The students worked at their jobs and earned faux paychecks. Annual reports and best company and best employee awards were given.

**3:00 THE CLOCK STATE SHOW— TIME FOR KIDS TO STAY IN MATH. Kylene Norman and John Bailey. Kylene Norman/John Bailey, Asst. Professors, Clark State Community College, 570 E. Leffel Lane, Springfield, Ohio, 45505.**

The Clock State Show is a mathematics enrichment program designed for general level seventh and eighth grade students. It explores the history and mathematics of time and the engineering of clocks and has the students actually build a model clock. The goal is to encourage these youngsters to stay in mathematics and shows them that they all have the ability to succeed in the subject. After the clock is built it is actually used as a calculator to add fractions and figure the distance covered by moving vehicles. It is also used as a protractor. All of this is done with comedy, props, costumes, and a general good time for all. This show and its counterpart, "The Clark Tac Computer", have played to over 12,000 students and adults nationwide. Adult audiences are constantly amazed at the timely mathematics they learn.

**3:45 THE C.L.E.A.R.S. PROJECT: COOPERATIVE LEARNING IN EDUCATION THROUGH ADVANCED RESOURCES IN SCIENCE. Christine Johnson, Science Department, Central-Hower High School, Akron Public Schools, 123 S. Forge St., Akron, OH 44308.**

A project for K through 12th grade science teachers in the Central-Hower cluster was conducted during the 1990-91 academic year. Pairs of teachers from six schools met monthly to learn about the use of videodiscs in their classrooms and the integration of cooperative learning strategies throughout the curriculum. Benefits for the teachers included receiving discs and players for their programs and having resource people available throughout the year. The building teams also relied on each other to learn about the materials/techniques and became the experts sought by colleagues in other subjects and grade levels. The University gained field experience sites where innovative science technology and teaching practices were being used. Goals included the development of lessons which incorporated the videodiscs and cooperative learning strategies into the existing curriculum. Presenters will describe the project along with recommendations for future workshops. Cooperative learning activities will be described and practiced. Samples from several videodiscs will be shown along with explanations and suggestions for purchase and use. An interactive program with Hypercard will be demonstrated and discussed.

## H. Science Education
## Third Afternoon
## 2:00 pm, Saturday, May 2, 1992
## College of Business Administration 149
## Cliff Schrader, Presiding

**2:30 A COMPARISON STUDY OF ADULTS' PERCEPTION OF COGNITIVE AN AFFECTIVE GAIN AS A RESULT OF A FORMAL OR NONFORMAL SCIENCE LEARNING EXPERIENCE. Betsy Feldkamp, 160 West Northwood, Columbus, OH 43201.**

The purpose of this descriptive study has been to investigate the difference of adults' perceptions of cognitive and affective learning between a nonformal and formal science learning experience. The problem has been that it has been difficult to determine if visitors to a nonformal institution have learned by using conventional measurement methods. The research question has been if persons believe themselves as having learned and to compare their responses with those from students enrolled in an introductory science class. The nonformal sample was visitors to a natural history museum and the formal sample was introductory science classes at a major university. The results of this research have shown that visitors do perceive themselves as having leamed (98.9%), a cognitive gain in knowledge, and had a positive attitude (90.0%), a gain in affective learning. The formal responses have not been as enthusiastic, 51.4% enjoyed the class and 76.3% believed they learned. Some additional findings are: Characteristics suggest the visitors have a higher than average level of education and are intrinsically motivated to pursuit nonformal and informal interests. The science interests of the visitors do not differ according to gender. The visitors relate what they learned applied to everyday life more so than the students. The characteristics of the visitors suggest a select rather than a general audience. Suggestions were made how nonformal and formal institutions could utilize this information.

**3:00 RECENT FINDINGS OF THE NATIONAL CENTER FOR SCIENCE TEACHING AND LEARNING. Dr. Arthur L. White, Director. Dr. Michael H. Klapper, CoDirector. NCSTL, Research Center 104, 1314 Kinnear Road, Columbus, OH 43212.**

The National Center for Science Teaching and Learning at The Ohio State University, funded by the Office of Educational Research and Improvement, U.S. Department of Education, promotes, conducts, and facilitates scientific research in science education. The only research center of its kind in the United States, the NCSTL focuses on external influences on science education. Among these influences are social, political, and economic forces, new technologies, and curriculum integration. The Center is particularly concerned with bridging the disparate "cultures" of science and science education. This symposium will present the results of selected research projects and will consider the fundamental question of the form scientific research should take in an applied public policy field.

## H. Science Education
## Poster Session
## Saturday, May 2, 1992
## College of Business Administration Concourse

**BOARD I**

**4:00 SCIENCE EDUCATION AND NATIONAL SECURITY. Craig W.Steele. Department of Biology& Health Services, Edinboro Univ., Edinboro, PA 16444.**

Science and technology are vital to the nation's economic development and military strength, to the improvement of our standard of living, and provide the basis for innnovation, productivity growth, and maintenance of the international competitiveness of the U.S. industrial sector. The dependency of U.S. military strength and economic viability on science and technology insures that they will continue to contribute directly to the nation's national security and to its influence in world affairs. Given the critical importance of science and technology to the national security of the U.S., we are not doing well in producing a science-literate citizenry. When compared to their peers in other industrialized nations, U.S. students score near the bottom in math, general science, chemistry and physics, and last in biology. We also have inadequate worker education in science and technology, and no deep reserve of workaday technicians, foremen, machine operators, and others who can follow blueprints, observe tolerance requirements, and solve rudimentary problems. The precollege and college science education and training of our citizens must be improved in order to maintain the science and technology base for military and economic security. This presentation will evaluate the policies of increased funding for science education and of increased science education in the curriculum, indicate the national security implications of these policies, and make specific recommendations for future U.S. Government policy in improving science education.

**BOARD J**

**4:00 A NEW, FAST MICROGEL PAGE SYSTEM FOR EDUCATION, RESEARCH AND FIELD BIOLOGY. G. S. Bambeck Ph.D. and R. M. Gesinski Ph.D. ZAXIS Inc., 1658 State Rd., Cuyahoga Falls, OH 44223**

In January 1988, we introduced GELTEACH, a modified very high resolution polyacrylamide electrophoresis (VHR PAGE) system for the educational curriculum. This VHR PAGE system is a ready to use research grade mini-gel style system with a complete semester of lab applications including Protein, Polypeptide, Native, SDS, DNA, 1D, IEF and 2D applications. The new microgel ultra high resolution (UHR) PAGE system is a modified miniature "clone" of GELTEACH. Called GELTREK, The Next Generation, it utilizes polymer chain length (PCL) control technology,which allows gels to be 3 times smaller, to be run 4 times faster and with full preservation of the database. Now, the classroom lesson plan can be completed in a single class period. A new 12V D.C. accepting power supply adaptor permits genetic analysis to be performed on site in real time, instead of back at the lab with accrued time delay and sample decay. This could be a boon to ecologists, seed company technicians, veterinarians, forensic pathologists, USDA and DNR researchers.

**PRESENTATIONS BY WINNERS OF 1990-91 BATTELLE AWARDS FOR PROFESSIONAL DEVELOPMENT.**

In 1991 The Ohio Academy of Science and Battelle Memorial Institute selected the winners of the Battelle Awards for Professional Development. Battelle Awards for Professional Development — an educational partnership of The Ohio Academy of Science and Battelle Memorial Institute — promotes professional development of science and mathematics. The Battelle Award winners who received a total of $12,500, will summarize their professional experiences this past year and be available to answer questions at the following times:

**Board K** Teresa Bettac
**4:00** Willis Intermediate School, Delaware
$3,000 Science Teacher Award

**Board L** Paul Lenz
**4:00** Miller City HS, Miller City
$3,000 Math Teacher Award

**Board M** Paul Lenz
**4:00** Miller City HS, Miller City
$3,250 Math School Award

**Board N** Sue Boon
**4:00** Louisville JS, Louisville
$3,250 Science School Award

## I. Anthropology & Sociology
## Only Morning
## 9:00 am, Saturday, May 2, 1992
## College of Business Administration 139
## Forrest J. Smith, Presiding

**9:00 HEALTH CARE IN JAPAN. T. Neal Garland, Department of Sociology, University of Akron, Akron, OH 44325.**

During the Meiji Era (1868-1912) Japan's leaders constructed a new health care system which was patterned after that of Germany, the world leader in medicine at that time. This basic structure has evolved into a medical system which provides care for nearly all Japanese citizens today. The cost of care is covered by a combination of public and private insurance plans. This paper provides a brief description of the structure of the care delivery system and of the system of financing health care in Japan. Strengths and weaknesses of these systems are discussed.

**9:15 AN EXPLORATORY STUDY OF A NEW TREATMENT APPROACH FOR ALCOHOLIC WOMEN. Terasa Bates, 482 High St., Doylestown OH 44230.**

This pilot study assesses a new treatment program for alcoholc women. Although men have had halfway house treatment facilities available to them, it has only been recently that women have had similar treatment programs available to them in northeastern Ohio. This study focuses on establishing a base line that assesses the social and psychological barriers that have prevented women from receiving adequate treatment for problems with alcohol. Specific issues of women are addressed and benefits of such halfway house treatment environments are outlined.

**9:30 AN ANALYSIS OF CHILDHOOD LEAD POISONING USING THE SOCIAL DRIFT HYPOTHESIS AND THE MULTIPLE-NUCLEI THEORY. Neenoo Khosla, Box 23 Van Campen Hall, Kent State University, Kent, OH 44243, Neeraj Badjatia, Box 4 Van Campen Hall, Kent State University, Kent, OH 44243, Nichole Brandts, Room 424 Fletcher Hall, Kent State University, Kent, OH 44243, Joan-Florence B. Salido, Box 31 Van Campen Hall, Kent State University, Kent, OH 44243 and Micah Meyer, Box 25 Van Campen Hall, Kent State University, Kent, OH 44243.**

Exposure to environmental lead is a common and societally devastating problem that occurs most prevalently in inner-city, industrialized districts. Exposure to low levels of lead induces lead poisoning, which in turn can have adverse effects on a child's health and intelligence. The social drift hyposthesis accounts for the tendency of lead poisoned individuals to fall to the lower end of the socioeconomic ladder. The multiple-nuclei model has ramifications which ultimately puts those individuals living in the inner-city at greatest risk to environmental lead exposure. An analysis of traffic, industry, and housing maps shows that there is a definite association between victims of lead poisoning and specific areas of inner-city Akron.

**9:45 JOB SATISFACTION AMONG NURSE ASSISTANTS WHO PARTICIPATED IN THE OHIO TEACHING NETWORK PROGRAM. Dorothy Blackmon (University of Akron), Naoko Oyabu (Mount Union College), T. Neal Garland (University of Akron), and Genevieve Gipson (Educational Consultants LTC); University of Akron Department of Sociology, Olin Hall, Akron, OH 44325-1905**

A significant part of an individual's life is spent performing a job. As more and more Americans are aging the care takers are becoming ever more important. Nurse assistants are the individuals who spend the majority of time with the elderly. Recent federal legislation stipulated that nurse assistants employed in nursing homes be trained and so they are qualified to care for the elderly. However, once nurse assistants are trained for their job are they satisfied with their job? This paper examines nurse assistants' job satisfaction following the Ohio Teaching Network program by using a pre-test and post-test to determine nurse assistant's job satisfaction in relation to their knowledge about care task, attitude toward the elderly and knowledge about the elderly.

**10:00 INTRINSIC ADAPTIVE CAPACITIES OF CYSTIC FIBROSIS FAMILIES. Geeta Sivagnanam and Brian Pendleton. The University of Akron Department of Sociology, Akron, OH 44325-1905.**

This study analyzes the Intrinsic Adaptive Capacities of families of individuals with Cystic Fibrosis. The conceptual framework for the present study derives from the theoretical paradigm proposed by David Reiss (1981). According to Reiss (1981) the intrinsic adaptive capacities of a family are made up of the three elements of configuration, coordination and closure. The present study presents the combination of IAC that characterizes families of individuals with Cystic Fibrosis. The sample for the present study comprised of adolescents and adults being treated for Cystic Fibrosis at a large hospital in the midwest. Results revealed that families of individuals with Cystic Fibrosis are characterized by low configuration, low coordination and low closure.

**10:15 DIFFERING PERSPECTIVES ON THE ADOLESCENT PREGNANCY: THE PHYSICIAN VERSUS THE TEENAGER. Sarah Babai, Celeste Durnwald, Ravi Karnani, Shabbir Khambati, Ian Wright c/o Ian Wright, Box 258 Beall Hall, Kent State University, Kent, OH 44243.**

Key properties of Glaser and Strauss' (1971) theory of status passage are applied in analysis of the differences in perspective between the medical ideal for managing adolescent pregnancy and the non-ideal teenage perspective. Relevant theories such as Suchman's (1965) stages of illness and medical care theory and Wolinsky's (1988) three dimensional model of health are also integrated in the analysis. Practical applications of the knowledge of these differences are emphasized because of the potential improvements that could result from a health care system that is equipped in understanding the needs of the at-risk pregnant adolescent population.

**10:30 FACTORS ASSOCIATED WITH OBESITY IN A SURVEY OF COLLEGE STUDENTS. Shermeil Dass, Julie H. Lee, Rob Mentzer, Steve Szabo, Tom Vo. Shermeil Dass, 2772 Richmond Road, Beachwood, OH 44122.**

There are many factors that contribute to obesity. A random sample of 123 respondents from a large university located in the midwest were used for the study. The factors that were found to have an association with perceived fitness levels are: mother's education level, mother's weight level, and television viewing time. The factors that did not have an association with perceived fitness levels are: guardian's influence, both parents' exercise habits, father's weight level, age, father's education level, and parents' occupation.

**10:45 PREDICTORS OF STRESSFUL AND SUPPORTIVE INTERPERSONAL RELATIONS BETWEEN NURSING ASSISTANTS AND NURSING HOME RESIDENTS AND THEIR FAMILIES. Terry Heiselman Albanese, The University of Akron, Department of Sociology, Akron, OH 44325-1905.**

Previous research has found the quality of interpersonal relations between residents, their families and nursing assistants to be important to residents' quality of care and the quality of nursing assistants' work life. This study examines the demographic and employment related predictors of supportive and stressful interpersonal relations between them. The sample consists of 101 nursing assistants who attended the 1990 Annual Nursing Assistant Convention in Cleveland, Ohio. Stepwise multiple regression results showed the best model for predicting supportive relations included all the variables and had an adjusted R square of .23. However, only supervisor support significantly predicted supportive relations. The best model for predicting

stressful relations included all variables except supervisor support. In this regression the adjusted R square was .19 with age as the only significant predictor. These results suggest that developing supportive supervisor-nursing assistant relations, with emphasis on younger nursing assistants, can have a positive impact on nursing assistants' relations with residents and their families.

## I. Anthropology & Sociology
## Only Afternoon and Business Mtg.
## 1:30 pm, Saturday, May 2, 1992
## College of Business Administration 139
## Steven Duray, Presiding

**2:00 ENAMEL DEFECT DISTRIBUTION IN HUMANS AND NONHUMAN PRIMATES. Stephen M. Duray, Dept. of Anthropology, Kent State University, Kent, OH 44242.**

The distribution of developmental enamel defects was examined for the prehistoric Libben population from Ottawa county, Ohio. These data were then compared to published data for other human populations and for major taxa of nonhuman primates. The sample consisted of 2,535 teeth, representing the permanent dentition of 157 individuals from the Libben population. Defects were classified based on the criteria of the Developmental Defects of Enamel (DDE) Index. Linear hypoplasias were the most frequently occurring defects in the sample. The highest frequency of these defects occurred in the maxillary central incisor, followed by the mandibular canine, maxillary canine, and maxillary lateral incisor. Linear hypoplasias were more common in maxillary than mandibular teeth, and more common in anterior than posterior teeth. This pattern of occurrence corresponds strongly with that found for other human populations. When compared with nonhuman primates, the human pattern and frequency is most similar to that of gorillas and chimpanzees. This similarity may be related to ontogenetic factors common to these three species of primate.

**2:15 THE EPPLEY ROCKSHELTER: A 12,000 YEAR RECORD OF NATIVE AMERICAN LIFE IN COSHOCTON COUNTY, OHIO. Nigel Brush, 772 Kimber Road, Wooster, OH 44691**

The Eppley Rockshelter is a multi-component site located in Coshocton County, eastcentral Ohio. The site was first occupied during the Paleo-Indian Period. Two radiocarbon samples taken from a large firehearth at the base of the cultural deposits were dated at 9,890 ± 100 years B.P. and 12,185 ± 130 years B.P. Subsequent occupations of the site occurred during the following periods: late Paleo-Indian; early, middle, and late Archaic; and early, middle, and late Woodland. Analysis of lithic debitage recovered from the rockshelter suggests that Native Americans were using this site, not only as a short-term hunting camp, but also as a long-term base camp.

**2:45 A COMPARISON: STATUS PASSAGES OF BLACK AND WHITE RECOVERING ALCOHOLICS. Jonathan A. Nadaud, Tanya Riley, Mark Thomas, Robin Williams. 3038 Capri Dr., Toledo, OH 43611.**

Status passage theory is used to compare the similarities and differences experienced by black and white recovering alcoholics. Research suggests that white recovering alcoholics are faced with, and experience, social characteristics which make their passage easier, more desirable, and more successful than black recovering alcoholics. Blacks are seen to have a better chance of social support, but the treatment centers are not designed to fit their cultural values and experiences. It is suggested that counseling services improve their programs to take into account the black perspective and use the high social support to assist black recovering alcoholics in their passage.

**3:00 VICTIM ASSISTANCE PROGRAM: A QUALITATIVE PROGRAM EVALUATION. Nuria Cuevas Feit, Robert Denton, Marvin D. Feit, Alan Sommers, School of Social Work, The University of Akron, Akron, OH 44325-8001.**

This paper discusses a qualitative program evaluation of the Victim Advocate component of a Victim Assistance Program in Northeast Ohio conducted in the fall of 1991. Interviews were conducted with clients, staff, and management. Observations were conducted of a victim group support meeting and the office. The victims interviewed were satisfied with the services, the staff and administration are highly motivated and provide service with much dedication to the agency purpose and mission. The support group meeting helped victims process the effects of the victimization on their lives (including second injury) and to help them develop the next steps in their lives. The respect for the victim seemed to emerge from this meeting and from the observations of the operations of the program. The evaluation occurred during a period of transition with two victim advocate staff positions unfilled. It appears that this is a solid program and the agency is openly facing the economic challenges before it with as minimal an effect as possible on the delivery of services to clients. Management and staff appear to be working together to continue the delivery of service to clients consistent with the program's mission and commitment.

**3:15 ETHNIC GROUP IDENTITIES AND VALUE ORIENTATIONS: AN EMPIRICAL STUDY. David Yonas, Summit Counseling Center, Akron, OH 44333, Naoko Oyabu, Mount Union College, Alliance, OH 44601, T. Neal Garland, University of Akron, Akron, OH 44325.**

The importance of ethnic identity in contempoary America has been widely debated by social scientists. This paper reports the results of an empirical study of value orientations and their relationship to ethnic group identities among a sample of first-time parents-to-be attending prenatal classes in northeastern Ohio. Ethnic identities generally were not found to be strongly related to value orientations among these respondents. Explanations for this finding are explored and implications for care providers are discussed.

**3:30 COLLEGE STUDENTS' ATTITUDES ABOUT MINIMUM WAGE. Dave Williams and Lynn Starn, 4889 Mechanicsburg Rd., Wooster OH 44691**

This study is part of a student undergraduate project in an Introduction to Sociology class. The study assesses the attitudes of college students about the minimum wage. The sample includes a large percentage of students who have worked at minimum wage jobs. Data include attitudes about whether the minimum wage should be raised or lowered. Attitudes about minimum wage earners are compared with individuals who receive public assistance. The results provide insight from an undergraduate point of view about important wage issues.

**3:45 ATTITUDES OF DRINKING AND DRIVING. Janet Michello, University of Akron, Wayne College, Orrville, OH 44667**

In recent years, the topic of alcohol abuse has received a great deal of attention. Individuals who abuse alcohol are a threat to themselves and others. The financial drain alone on society has been estimated to be $120 billion for treatment and medical care of alcohol related illnesses and injuries. This study identifies attitudes regarding drinking and driving. In addition, social characteristics of abusive drinkers are assessed and categorized. The data obtained have implications for identifying potential alcohol abusers. Strategies for prevention and treatment are suggested .

**4:00 COLLEGE STUDENTS' PERCEPTIONS OF THE SOCIAL COSTS OF VANDALISM: IMPLICATIONS FOR REPORTING AND PREVENTION. John W. McKeon, PhD. Walsh College, Behavioral Sciences, North Canton, OH 44720.**

Several years ago, Robert Rubel reviewed the literature on vandalism and found that most discussions focused on the monetary costs of vandalism. Rubel suggested that this onesided, economic view of vandalism be balanced with the equally important perception that vandalism has serious social impacts on the community. This paper reports the results of a questionnaire survey on the perception of the social costs of vandalism. Respondents were full-time students at a northeast Ohio liberal arts college. The response rate was 86% (N= 344). Surprisingly, most of the respondents (53%) did not consider themselves to be personal victims of other people's acts of vandalism. Moreover, and consistent with Rubel's observations, among the 47% who did consider themselves to be personal victims, most (53%) cited monetary reasons solely and 26% cited both monetary and social reasons. Only 21% cited social reasons solely. This lack of perception of the social costs of vandalism has serious implications for the reporting of and the prevention of vandalism. Supplemental analysis of faculty and administrators' responses (N= 31 or response rate of 52%) revealed only slightly improved perceptions of the social costs/impacts of vandalism.

**4:30 RELOCATION AND AMERICAN INDIAN ASSIMILATION. Lynn Metzger, Department of Sociology, The University of Akron, Akron, OH 44325-1905.**

The Federal Government's, Bureau of Indian Affairs, Employment Assistance Program, called "Relocation" moved thousands of American Indians from their reservations to large cities during the 1960's. Relocation was another plan to encourage Indians to assimilate into white society. This paper discusses the impact of this cultural assimilation and the diverse Indian community in Cleveland Ohio.

**4:45 ANALYZING LOST BONES. Elizabeth A. Mancz, Department of Sociology, The University of Akron, Akron, OH 44325-1905**

The study of faunal samples is affected in a fundamental way by lack of completeness. Few archaeological samples present a complete picture of the animal-keeping practices of the culture in question. Attrition to the sample is caused by the actions of humans, animals and inanimate forces of nature. Yet the faunal analyst can derive significant information from the study of such samples by using information from these lost bones, as well as the bones that are actually present. This paper discusses how and why such bones get "lost", the methodologies used to study them and the data that are derived from those bones.

## J. Natural Resources
## Only Afternoon & Business Mtg.
## 1:30 pm, Saturday, May 2, 1992
## College of Business Administration 135
## Henry H. Smith, Presiding

**2:00 THE INTEGRATION OF SCIENTIFIC RESEARCH AND PUBLIC POLICY IN DEALING WITH SEDIMENT IN LOADING AND TURBIDITY IN OHIO RESERVOIRS. Keith L. James (Junior), International Center for Water Resources Management, Central State University, Wilberforce, OH 45384, and Dr. Roy A. Stein (Faculty Advisor), The Ohio State University, Columbus, OH.**

The purpose of this research project was to integrate the scientific research concerning turbidity and sediment loading with the public policy aspects of lake and watershed management. Sediment loading and turbidity affecting the saugeye fish was examined at Lake Logan and Pleasant Hill Reservoir both of which were observed and sampled in this project. Also, data on the social, economical and political issues arising from sediment loading and turbidity deterioration in lakes were collected and analyzed. The results of this study points to the need to tie water quality, water conservation and land related resources planning more closely to research.

**2:15 WHY OHIO NEEDS POLLUTION PREVENTION. Anthony Sasson, Ohio Environmental Protection Agency, Pollution Prevention Section, P.O. Box 1049, Columbus, OH 43266-0149**

Pollution prevention is a concept with great potential which is receiving increasing emphasis in the State of Ohio. It offers an alternative to the high costs and other problems of pollution control. Ohio has many opportunities for pollution prevention due to its varied economic base and large population. Ohio is one of the largest waste-generating states, ranking third in the U.S. in 1989 under the federal Toxic Chemical Release Inventory. The state ranks first in sulfur dioxide emissions, and generates about 15 million tons per year of solid waste. However, numerous examples of the reduction of waste and environmental releases through pollution prevention exist in Ohio industry. Our businesses and government are beginning to incorporate the concept into their activities through technical innovations and improved management practices. Pollution prevention will define the future of environmental protection in Ohio.

**2:45 WATER QUALITY MONITORING AND STREAM INSPECTION. Yvonne Gotlop (Junior), International Center for Water Resources Management, Central State University, Wilberforce, OH 45384.**

The purpose of the research described here is to monitor the quality of selected Ohio streams to ensure compliance with the requirements of the Clean Water Act. Water quality parameters such as pH, conductivity, time-of-travel, dissolved oxygen, stream flow and cross section were measured on a biweekly basis to ensure maintenance of adequate stream water quality. These field surveys were conducted during low flow periods for three months in the Northeast and Southwest regions of Ohio. The monitoring time was chosen to correspond to the critical period in the deterioration of in-stream water. Sampling-points along streams were selected to ensure that samples were collected upstream and downstream of the mixing zone in each case. The results of the monitoring effort indicate that most streams sampled do not violate the existing water quality guidelines.

**3:00 INNOVATIVE MUNICIPAL SOLID WASTE RECYCLING SYSTEM. Walter C. Roman. Three R Technologies, Inc., 7870 Olentangy River Road, Suite 311, Columbus, OH 43235**

As landfills continue to fill up and the cost of handling municipal solid waste (MSW) continues to rise, new and innovative methods of handling MSW must be implemented. Unlike curbside recycling, for example, future methods of processing MSW must be able to recover large percentages of the MSW and do it economically. The 3RT system is a modular system that can be broken down into 3 major areas: recovery of recyclables, production of refuse derived fuels (RDF), and composting. The recycling module can be customized to recover any number of different materials, such as aluminum cans and scrap, ferrous cans and scrap, newsprint, mixed paper, corrugated, different types of plastic bottles and jugs, and glass, separated by color or mixed. The RDF module can produce RDF in the form of pellets, logs or as a fluff material. It has a very low ash content and burns very cleanly. It can be used in trash burning power plants, mixed with coal in coal fired power plants, or it can be used in wood burning stoves or fireplaces. The composting module uses a patented self-propelled windrow composter and composting pad.

**3:30 SOIL COLUMN COLLECTION DEVICE Larry C. Brown and Robert G. Holmes, Department of Agricultural Engineering, The Ohio State University, 590 Woody Hayes Drive, Columbus, OH 43210**

Soil columns often are used in chemical transport studies. Devices and methodologies for obtaining undisturbed soil columns over a range of diameters and depths are few. A device has been developed for collecting undisturbed, large diameter soil cores for use in soil column/solute transport studies. The device, which uses hydraulic power to insert hollow sample cylinders into soil, provides a reliable and relatively quick sampling process with minimal labor requirements via a hydraulic control circuit designed specifically for the application. Controls allow the operator to regulate the insertion process to minimize compressional disturbances of the sample, producing a core representative of the soil profile. The current design can accommodate hollow cylinder insertion in a cohesive soil to a depth of 1 m, and any diameter of sample container up to 60 cm. Helical earth anchors are used to secure the device for stabilization of the insertion process. The design, fabrication, testing and costs for the device, as well as the application of the technology at research sites in Ohio and Indiana are described.

**4:00 REMEDIATION OF ACID MINE DRAINAGE USING A CONSTRUCTED WETLAND. Olusegun Aiyetigha (Junior), Newland Agbenowosi (Sophomore), and Subramania I. Sritharan (Faculty Advisor), International Center for Water Resources Management, Central State University, Wilberforce, OH 45384**

This paper presents the results of an effort to reduce iron concentration and increase pH using cattails growing in a man-made wetland in Southeastern Ohio. The paper compares the theoretical removal capabilities using the known chain of chemical reactions for iron in natural uncontrolled acid mine drainage to the observed values. The comparison enables the assessment of the impact of retention time, cattails and substrate materials on the processes. The temporal variation of retention for the available measurement period will be presented. The overall results indicate that the wetland has been effective in reducing the total iron concentration.

**4:15 ENVIRONMENTAL TRENDS IN COMIC STRIPS. Doreen E. Grener and Richard R. Jurin. 210 Kottman Hall, School of Natural Resources, 2021 Coffey Road, The Ohio State University, Columbus, OH 43210.**

Comic strips tend to reflect social concerns of the day. There was a resurgent interest in environmental concerns with the celebration of Earth Day 1990. Comic strips encompassing the period of January 1989 through September 1991 were studied to determine the frequency and scope of environmental topics covered. *The Columbus Dispatch* comic section was selected for sampling in this study. Each comic was examined for environmental topic and date of coverage. The data reflected definite trends in coverage and several topics proved to be more frequently used. Pollution, toxic waste, and recycling were the most popular topics chosen. Endangered species and extinction of modern species also proved to be

popular topics for use by cartoonists. The frequency of environmental topics increased when there was prominent coverage of a major environmental issue in the newspaper, such as Earth Day or the Exxon Valdez oil spill. Monday proved to be the most popular day for an environmental theme to occur, and several comic strips were more likely than others to have environmental themes associated with them.

## K. Genetics and Cell Biology
## Only Morning
## 9:00 am, Saturday, May 2, 1992
## College of Business Administration 145
## Mark Gorman, Presiding

**9:00 MATERNAL LINEAGE DERIVATION OF THE SPONTANEOUSLY HYPERTENSIVE RAT AND WISTAR KYOTO RAT. S. Perry, M. Turner, D. Ely and M. Johnson. Department of Biology, The University of Akron, Akron,OH 44325.**

The spontaneously hypertensive rat (SHR) and its normotensive counterpart, the Wistar-Kyoto rat (WKY), have been used extensively as a model of human essential hypertension. These strains were derived from an outbred Wistar colony 30 years ago. Our studies revealed a high degree of nuclear DNA divergence between strains, equal to several million years of separation. This result suggests that the original Wistar colony was highly polymorphic. To test this hypothesis and better understand the origin of this divergence, we undertook an examination of mitochondrial DNA (mtDNA) isolated from these strains. MtDNA is maternally inherited. MtDNA was digested with several restriction enzymes (EcoRI, HpaII, HincII, TaqI, HinfI, Hae III and HhaI), electrophoresed on 0.8% agarose gels and the mtDNA fragments visualized. No polymorphisms were detected. We have used these data to construct a restriction enzyme map of the SHR and WKY rat mtDNA. The lack of mtDNA restriction fragment linked polymorphisms suggests that SHR and WKY share a common ancestral mother, consistent with the known, recent derivation of these strains. This data supports the hypothesis that the original colony was highly polymorphic.

**9:15 A COMPARATIVE ANALYSIS OF TUMORIGENIC HUMAN ESOPHAGEAL CELL LINES, TE-1 AND TE-2, WITH THE NON-TUMORIGENIC CELL LINE HET-1A: I. Marshall and R. J. Jamasbi. Bowling Green State University, Department of Biological Sciences, Bowling Green, OH 43403.**

Certain malignant tumors have been shown to possess different subpopulations which are believed to account for their heterogeneity. In this study, two human esophageal cell lines TE- 1 (well-differentiated) and TE-2 (poorly-differentiated), clones isolated from each and non-tumorigenic human esophagus HET- 1 A were compared using image analysis. The cells were grown in culture, synchronized, fixed, stained by Feulgen and analyzed by image analysis. Several parameters were compared. These included the cell boundry, area, shape factor (roundness), DNA content etc. The results showed that there are no obvious differences between the parental lines and their isolated clones. Some similarities were observed between the two parental carcinoma lines. However, the major differences were observed between the carcinoma lines and the HET -1 A line. Supported by a FRC grant.

**9:30 MUTATIONS AT THE *SCF* and *KIT* LOCI MAY BE INVOLVED IN OVARIAN TUMORIGENESIS. A.G. Amador. Dept. OB/GYN, SIU School of Medicine, Springfield, IL 62794-9230.**

A characteristic of ovarian tumors is the loss of LH receptors (LH-R) with the progression of the disease. This has been found to be true in both humans and mice. It now appears that ovarian tumorigenesis and the changes in LH-R might both be due to the same genetic changes. The mouse models for epithelial ovarian tumors have mutations at the *W* or *Sl* loci. Both loci are conserved in humans. The *Sl* locus codes for *SCF*, and is located on human chromosome #12 (q21). The *W* locus encompasses the *KIT* locus whose product is the receptor for *SCF*, and is located on chromosome #4 (q11-q22). Changes in the allelic composition of the *W* and *Sl* loci alter the basal levels of LH-R in mice, as well as the gonadotropin-dependent changes in LH-R synthesis. These same mutations are responsible, in mice, for the appearance of ovarian tumors that, just like their homologous tumors in humans, lack LH-R. It could be concluded that mutations at these important developmental loci, might be at least in part responsible for ovarian tumorigenesis.

**9:45 DEVELOPMENTALLY-RESTRICTED EXPRESSION OF A NOVEL PROTEIN-TYROSINE KINASE IN THE NEMATODE *CAENORHABDITIS ELEGANS*. William R. Morgan. The College of Wooster, Dept. of Biology, Wooster, OH 44691**

Protein-tyrosine kinases (PTKs) have been repeatedly implicated in the intercellular regulation of developmental processes in a diverse range of multicellular organisms. To further understand the role of PTKs in the development of metazoans, we have initiated a program to analyze PTKs in the experimentally manipulable model organism *Caenorhabditis elegans*. To isolate *C. elegans* PTK genes, a degenerate oligonucleotide probe corresponding to a highly conserved amino acid motif was used to screen a genomic library. Restriction enzyme and DNA sequence analysis of two genomic clones identified a cluster of genes which include two tandem genes encoding novel transmembrane PTKs *[ctk(L5a) and ctk(L5b)]*, an apparent PTK pseudogene, and part of a fourth PTK gene *[ctk(L5d)]*. The novel PTKs lack a large extracellular domain; perhaps they function by interacting with an extracellular secondary protein. To investigate the potential role of these PTK genes in development, we initially examined the expression of a *ctk*(L5b)/lacZ fusion gene. Expression was restricted (with a single exception) to the large hypodermal syncitium (hyp7) of the animal, initiating immediately after hatching and continuing into adulthood. Composed of 23 nuclei at hatching, the single-celled hyp7 syncitium increases to 133 nuclei during larval development by fusion with post-embryonically derived cells. The role of the *ctk*(L5b) gene product in this process or in other aspects of hyp7 function is under investigation.

## K. Genetics and Cell Biology
## Only Afternoon & Business Mtg .
## 1:30 pm, Saturday, May 2, 1992
## College of Business Administration 145
## Mark Gorman, Presiding

**2:00 INVESTIGATION OF SEVEN SUBSURFACE BACTERIA ABLE TO GROW IN THE PRESENCE OF XENOBIOTICS. Christopher L. Bourne* and Martha M. Kory. The University of Akron, Dept. of Biology, Akron, OH 44325-3908.**

Subsurface bacteria were isolated from the Savannah River Plant in Aiken, South Carolina. The isolates were obtained from the Subsurface Microbial Culture Collection of Florida State University. The seven bacteria consist of five Gram negative rods and two Gram positive rods. Of the five Gram negative rods, three are species of *Pseudomonas* and two are not identifiable by the API rapid test for nonfermenting Gram negative rods. Both of the Gram positive rods are probably species of *Arthrobacter* based on cellular and colonial morphologies. The bacteria grow in peptone-tryptone-yeast extract-glucose medium (PTYG) supplemented with various xenobiotic organic compounds including phenol, pyridine, aniline, naphthol, naphthalene and nitrobenzene. Furthermore, the isolates grow in the presence of each of these organic compounds in a minimal medium containing only basal salts and glucose. All cultures were grown on an aerobic shaker and growth was measured spectrophotometrically. The ability of the organisms to grow in the presence of xenobiotic organic compounds is a prerequisite for the ultimate goal of these organisms being able to degrade the xenobiotics to harmless compounds.

**2:15 SITE DIRECTED MUTAGENESIS: *CIS*-DIAMMINEDICHLOROPLATINUM(II). Doris J. Beck Paul A. Dahlhauser and Beth A. Miles, Department of Biological Sciences, Bowling Green State University, Bowling Green, OH 43402**

The plasmid pZ189 (Seidman et al., 1985, Gene, 38: 233-237) is a shuttle vector which is able to replicate in cells permissive to SV40 replication since it has the origin and early gene region from SV40 virus. Replication and selection of transformants in *E. coli* is facilitated by the origin of replication from pBR327 and the *Amp* gene respectively. The target gene for mutagenesis is *sup* F, a bacterial suppressor tRNA gene whose product can be screened in *E. coli* having amber mutations in the *lac* Z gene. The Ava I site at position 4055 of pZ189 was inactivated yielding plasmid pDB3. pDB4 was derived from pDB3 by deletion of 8 bases flanked by Csp 45 I sites of the target gene. A heteroduplex molecule composed of pDB3 linearized with

Eco RI and pDB4 linearized with Csp 45 I was made by denaturing and reannealing equal amounts of the two DNA molecules. An 8 base oligonucleotide containing a single *cis*-diamminedichloroplatinum(II) adduct was ligated into the 8 base gap of purified heteroduplex molecules. Covalently closed molecules were purified for use in mutagenesis assay. The use of plasmid vectors harboring a specific adduct at a single site within a target molecule obviates ambiguity in traditional mutagenesis assays and facilitates the correlation of biological phenomena such as mutations or repair with a known adduct.

**2:30 ANALYSIS OF POLYMORPHISMS OF THE ZIPPER REGION OF THE SYSTEM LUPUS ERYTHEMATOSUS 52kD ANTIGEN.**
**Tracy S. Dinin, Mark B. Frank, Baldwin-Wallace College, 275 Eastland Road, Berea, OH 44017.**

A cDNA clone encoding the 52kD antigen associated with systemic lupus erythematosus (SLE) was previously isolated and sequenced. The predicted protein contains both a zinc finger and leucine zipper motif, which encompasses a single epitope. In this study, we wanted to determine if the nucleotide sequence encoding the epitope is polymorphic among SLE patients, and are any polymorphisms correlated with the presence of anti-52kD autoantibodies? DNA from 10 SLE patients and 1 healthy control was examined using two techniques, restriction fragment length polymorphism (RFLP) determination and dideoxy sequencing. RFLPs were found for the restriction *MspI* and *TaqI*. The RFLP for *MspI* does not correlate with the presence of autoantibodies. The *TaqI* RFLP indicated a possible weak correlation between the RFLP and the presence of autoantibodies. For definitive analysis of the question, dideoxy sequencing was used to examine the epitope region. Primary examination of these sequences revealed no sequence difference between patients. Thus, there does not appear to be a specific nucleotide sequence which is correlated with the presence of anti-52kD antibodies in these SLE patients. However, only one patient with high titer autoantibodies has been sequenced. Therefore if these results are to be confirmed, more patients with high titer autoantibodies should be sequenced.

**2:45 INTRON LOSS FROM THE COXII GENE IN *CATHARANTHUS ROSEUS* AND *VINCA MINOR* INVOLVES A PROCESSED RNA INTERMEDIATE.**
**Susan B. Grau, Mohammed Fazle Rabbi and Kenneth G. Wilson. Department of Botany, Miami University, Oxford, OH 45056.**

The editing of RNA is a post transcriptional event that is correlated with intron splicing in the mitochondrial genes of many higher plants. It involves a nucleotide base pair change of C to U following the transcription of the mRNA. We investigated the possibility that RNA processing plays a role in the loss of the coxII intron in the two apocynaceous plants, *Catharanthus roseus* and *Vinca minor*. Of the 16 apocynaceous plants tested, our group found *C. roseus* and *V. minor* to be the only two members of this family to lack the intron found in the center of the coxII (Cytochrome oxidase C) gene. We proposed that the loss of this group II intron was due to RNA processing, cDNA production, and gene splicing mechanisms. We cloned the PCR-amplified fragment of interest, using the TA Cloning System by Invitrogen, and then we sequenced the portions of the coxII gene that normally would contain this intron. Our sequence data showed that the four RNA editing sites were changed in the DNA in both *C. roseus* and *V. minor*, thus corroborating the hypothesis that editing of the gene occurred simultaneously with the loss of the intron. This is in agreement with the hypothesis that a processed RNA was involved in the intron loss, presumably through a cDNA intermediate. Related out-groups, such as *Asclepias* of the milkweed family Asclepiadaceae, require RNA editing for a functional message.

**3:00 LYSINE GENES OF *SACCHAROMYCES CEREVISIAE, SCHIZOSACCAROMYCES POMBE,* AND *CANDIDA ALBICANS*.**
**Richard A. Ford, Richard C. Garrad, Sudha Rajnarayan, and J. K. Bhattacharjee*, Department of Microbiology, Miami University, Oxford, OH 45056.**

Amino acid lysine is synthesized by two distinct pathways in nature. The diaminopimelic acid pathway is used by bacteria and plants. The *a*-aminoadipate pathway is unique, being present only in fungi. This pathway consists of eight enzyme steps controlled by more than ten genes in the yeast *Saccharomyces cerevisiae*. Lysine genes of *S. cerevisiae, Schizosaccharomyces pombe,* and *Candida albicans* have been cloned by functional complementation of the lysine auxotrophs of *S. cerevisiae* and *S. pombe* with recombinant plasmids from the genomic libraries of appropriate yeasts. The *LYS2* and *LYS5* genes of *S. cerevisiae* encode the *a*-aminoadipate reductase enzyme. The *LYS2* gene encodes the large subunit and the *LYS5* gene encodes the small subunit of this enzyme. The *LYS1* and *LYS7* genes of *S. pombe* are isofunctional to the *LYS2* and *LYS5* genes, respectively, of *S. cerevisiae*. The *LYS1* gene of *S. cerevisiae* and *LYS1* gene of *C. albicans* encode Saccharopine dehydrogenase for the last biosynthetic step. Results of restriction analysis, heterologous transformation, Southern homology and the enzyme activities in the homologous and heterologous transformants enabled us to determine the comparative molecular natures of these selected lysine genes of three different yeasts.

**3:15 GENUS IDENTIFICATION OF TWO ACTINOMYCETES PARACHLOROPHENOL-DEGRADING BACTERIA.**
**Thomas C. Tallant* and Martha M. Kory. The University of Akron, Akron, OH 44325.**

Two Actinomycetes (isolates B and F) which degrade parachlorophenol were isolated from an aerobic digester in 1986. Due to the problems involved in the identification of environmental Gram positive bacteria, the organisms have only recently been classified to the genus level. The Actinomycetes are identified as *Arthrobacter,* a member of the Coryneform group and *Promicromonospora,* a member of the Nocardioform group. Identifications are based on morphological observations, isolation of peptidoglycan amino acids and cell wall sugars and selected biochemical tests. The *Arthrobacter* was identified based on Coryneform cellular and colonial morphologies, a rod-to-coccus life cycle and lysine as the only diamino acid in the peptidoglycan. The *Promicromonospora* was identified by the presence of fragmenting substrate hyphae, rudimentary aerial hyphae, Nocardioform colonial morphology, lysine as the sole diamino acid in the peptidoglycan, galactose as the only detectable cell wall sugar and numerous biochemical tests. Peptidoglycan isolation from the *Arthrobacter* was done by sonication and fractional centrifugation. Peptidoglycan and cell wall sugars were isolated from *Promicromonospora* by alkaline-heat treatment (Reading method). Identifications of the amino acids and sugars were done by paper chromatography. These two bacteria may be important for *in situ* degradation of parachlorophenol and related compounds.

**3:30 ARACHIDONIC ACID AMPLIFIES DEPOLARIZATION-INDUCED SECRETION OF INSULIN FROM ISOLATED PANCREATIC ISLETS.**
**Stephen M. Pasquale. Dept. of Biology, Antioch College, Yellow Springs, OH 45387.**

Glucose induces phospholipid hydrolysis in pancreatic islets and accumulation of unesterified arachidonic acid. Here we demonstrate that arachidonicacid amplifies insulin secretion from islets induced by submaximally depolarizing concentrations of $K^+$ and does not influence either basal secretion or maximal depolarization-induced secretion. The half-maximally effective concentration of arachidonate was 11 μM; the maximally effective concentration was 30 μM. The amplification of $K^+$ -induced secretion by arachidonate was apparent within 3 min with perifused islets and was sustained for at least 25 min. Determination of whether this effect of arachidonate is direct or mediated by arachidonate metabolites was complicated by the fact that inhibitors of arachidonate oxygenases (BW755C and NDGA) inhibited $K^+$ -induced secretion even in the absence of arachidonic acid. The most abundant islet arachidonate metabolite (12-hydroxy-eicosa-5,8,10,14)-tetraenoic acid (or 12-HETE) was found not to influence $K^+$ -induced insulin secretion, although its precursor (12-HPETE) amplified $K^+$ -induced secretion. Inhibition of $K^+$ -induced secretion by BW755C was not reversed by 12-HPETE or 12-HETE. The long chain unsaturated fatty acids linoleate and linolenate, like arachidonate, amplified insulin secretion induced by submaximally depolarizing concentrations of $K^+$.

**3:45 GENETIC VARIABILITY OF LACTATE DEHYDROGENASE IN ENCLOSED AND FREE-RANGING OHIO WHITE-TAILED DEER, *ODOCOILEUS VIRGINIANUS*.**
**Justine A. Coppinger and Bonnie L. Lamvermeyer, Biology Department, Denison University, Granville, OH 43023**

Lactate dehydrogenase (LDH) is an enzyme responsible for the conversion of pyruvate to lactic acid at the end of glycolysis under anaerobic conditions. LDH exists in five multimeric forms, called isoenzymes, each with a distinct electrical charge due to minute differences in amino acid composition. The five isoenzymes can be separated by charge using electrophoretic techniques. This project employed polyacrylamide gel electrophoresis and a subsequent NAD+/lactate stain to determine the LDH isoenzyme banding patterns in different organs of Ohio free-ranging and an enclosed population of white-tailed deer, *Odocoileus virginianus*. The banding patterns in the selected organs of both populations were compared to determine if the enclosed herd was as genetically variable as the free-ranging population. Preliminary qualitative results indicated that the free-ranging deer showed

more variation of LDH banding in both heart and liver samples than did the organs of the enclosed deer.

**4:00 CONTROL OF EARLY ONTOGENY INDUCES HERITABLE CHANGE IN *R* GENE EXPRESSION IN MAIZE. Bernard C. Mikula, Defiance College, Defiance, OH 43512**

Heritable change in paramutant *R* gene expression is related to daylength and temperature conditions administered over a four-day period when maize seedlings are induced to flower. Environmental control at this time of ontogeny is shown to influence the range of heritable states of paramutated *R* gene regulation among the gametes sampled from the resulting floral mosaic. Since paramutated *R* gene expression in one generation can be additive in subsequent generations, a demonstration of environmental control has important theoretical consequences for genetic theory.

**4:15 RFLP MAPPING IN *LINUM USITATISSIMUM*. M. Gorman, R. Schneeberger, C. Cullis and L. Wendtland. Biology Departments of Baldwin-Wallace College, Berea, OH 44017 and Case Western Reserve U., Cleveland, OH 44107.**

We have been engaged in the construction of a linkage map in flax. This map is based primarily on RFLPs, but also includes biochemical and morphological markers. This effort has been supported by a grant from the NSF and a grant from the Ohio Board of Regents. It has involved numerous BW undergraduates enrolled in either a formal molecular biology course or in independent studies. The current status of the map will be reviewed and the role undergraduate students have played in its development will be described. We will also present results from pulse-field electrophoresis blots probed with a flax 5s rRNA clone which reveals two tightly linked RFLPs in conventional Southern blots. We have been screening Southerns of F2 DNA with this probe to calculate linkage distance between the two RFLPs. This same probe hybridizes to a single pulse field fragment when high MW DNA is cut with certain rare-target restriction enzymes. Thus, we have been able to make an estimate of the relationship between linkage distance (cM) and physical distance (kb) at least for this region of the flax genome.

## K. Genetics and Cell Biology
## Poster Session
## Saturday, May 2, 1992
## College of Business Administration Concourse

**BOARD A**

**10:00 ISOLATION OF AND PRODUCTION OF ANTIBODIES TO THE GPI-LINKED ALKALINE PHOSPHATASE FROM INTACT HUMAN NEUTROPHILS. Timothy J. Cain and John M. Robinson, Department of Cell Biology, Neurobiology and Anatomy, Ohio State University, 333 West Tenth Avenue, Columbus, OH 43210.**

Human neutrophils contain an intracellular pool of alkaline phosphatase (AlkPase) which is associated with a novel membrane-bound compartment (Kobayashi and Robinson, *J. Cell Biol.*, (1991) **113**: 743-56.). Stimulation of neutrophils with the chemotactic peptide fMet-Leu-Phe (fMLP) leads to the rapid expression of essentially all of the AlkPase on the cell surface. Pretreatment of neutrophils with cytochalasin B followed by fMLP likewise leads to the expression of AlkPase on the cell surface. In this case subsequent internalization of the plasmalemma is minimized. This system has been utilized for the isolation and purification of neutrophil AlkPase. These cells were treated with phosphatidylinositol-specific phospholipase C in order to release GPI-linked proteins from the neutrophil surface. Supernatants from these preparations contained 8-10 proteins, one of which we have identified as AlkPase. This enzyme was purified by electrophoresis in a non-denaturing gel system and subsequent electroelution. Using this approach we have purified neutrophil AlkPase to homogeneity which was then used for immunization. Using western blot analysis and immunocytochemical localization we are able to demonstrate anti-sera with positive cross-reactivity for human neutrophil AlkPase.

**BOARD B**

**10:00 EVIDENCE THAT TESTICULAR MACROPHAGE EXERT A PARACRINE EFFECT IN LONG TERM LEYDIG CELL CULTURES. Sara J. Guth and John R.D. Stalvey. Dept. of Biological Sciences, Kent State University, Kent, OH 44242.**

Leydig cells are the primary site of synthesis and secretion of androgens in response to stimulation from luteinizing hormone. The anatomical and functional organization of the testis suggests there also may be local paracrine and autocrine regulation within the testis. The present study was designed to study the effects of testicular macrophages on the key steroidogenic enzyme, 3ß-hydroxysteroid dehydrogenase-isomerase (3ßHSD), in cultured Leydig cells. Leydig cells were isolated from C57BL/6J inbred mice using a 40% percoll density gradient. The preparations yield 85-90% Leydig cells, with 6-8% testicular macrophage contamination. Macrophage were removed by plating cells for increasing amounts of time and then transferring the Leydig cells to a new culture plate. Pre-plating Leydig cells for 0.5 min. resulted in maximal removal of macrophage (< 1.0 % remaining), with minimal removal of Leydig cells. After a 3 hour culture, preplated Leydig cells had the same 3ßHSD activity as Leydig cells without preplating. After 5 days culture in RPMI 1640 supplemented with 15% horse serum medium, there was not a significant difference in 3ßHSD activity between the two treatment groups. However, after 14 days, Leydig cell cultures without preplating had significantly higher 3ßHSD activity compared to pre-plated cultures. Thus, there was a greater decline in 3ßHSD activity from day 0 to 14 in the preplated Leydig cell cultures compared to the cultures without pre-plating. Macrophage have been reported to exert a paracrine effect on Leydig cells and enhance Leydig cell testosterone production. We hypothesize that macrophage exert a paracrine effect on Leydig cell function by 14 days in culture. Macrophage may slow down the loss of 3ßHSD activity in culture, explaining why cultures without pre-plating have higher activity at 14 days. These data note the importance of determining cell contaminants in a culture system prior to studying isolated cell function.

**BOARD C**

**10:00 PURIFICATION AND CHARACTERIZATION OF RECOMBINANT TYPE II cAMP DEPENDENT PROTEIN KINASE REGULATORY SUBUNIT AND N-TERMINAL DELETION MUTANTS. Cheryl A.S. Hastings and Erwin M. Reimann, Department of Biochemistry and Molecular Biology, Medical College of Ohio, Toledo, OH 43699-0008**

Type II cAMP-dependent protein kinase is composed of dimeric regulatory subunits and two monomeric catalytic subunits. The dimerizing domain of the regulatory subunits has been located within the first 45 N-terminal residues. The purpose of this work was to further localize the region required for dimer formation. Recombinant DNA techniques were used to create deletions of 5, 10, and 20 amino acids. The mutant proteins were expressed in *E. coli* using the pET9d (Studier vector) expression system. Proteins were purified either by a combination of cAMP affinity chromatography and ion-exchange chromatography on DEAE cellulose (for 5 and 20 amino acid deletions) or by solubilizing in 6.4 M guanidine hydrochloride followed by dilution to renature the protein and chromatography on DEAE cellulose (for the 10 amino acid deletion). Gel filtration, gel electrophoresis and a gel overlay technique indicated that the ability to form dimers was slightly diminished with the deletion of 5 amino acids, but eliminated when 10 or more amino acids were missing. These findings suggest that residues 5-10 are critical for dimerization.

**BOARD D**

**10:00 THE STABILIZATION OF A LABILE MICROFILAMENT NETWORK IN *VAUCHERIA* EMPLOYING A NEW FIXATIVE. Donald W. Ott and James E. Dennison, Department of Biology, The University of Akron, Akron, OH. 44325 USA.**

A new fixation protocol utilizing a new fixative will be demonstrated that has successfully stabilized a fine microfilament network that has not been stabilized through the use of conventional fixation protocols involving glutaraldehyde and osmium tetroxide. This new fixative stabilizes not only the microfilament network in the vegetative filaments of *Vaucheria*, but also a motility-associated-reticulum (MAR), and various associated vesicles. The introduction of glutaraldehyde to the vegetative filaments causes a rapid breakdown of the MAR system into small vesicles and concurrent with the breakdown of this system the associated organelles such as mitochondria and vesicles either sink into the cytoplasm or disappear. Since it is believed that the MAR system and the translocation of the various organelles depend upon the microfilament network for their spatial stability, an accurate morphological assessment of these organelles is not possible using a conventional fixation protocol. The use of the new initial fixative, however, stabilizes this microfilament network and *in vivo* DIC observations are comparable to the TEM observations. This new fixative may also stabilize a putative myosin like molecule on the surface of the various organelles that utilize the microfilament network.

**BOARD E**

**10:00 TEM OF ISOLATED MICROTUBULE BUNDLES FROM VAUCHERIA LONGICAULIS. Eric W. Linton and Donald W. Ott, Department of Biology, The University of Akron, Akron, OH 44325.**

*Vaucheria longicaulis* is a coenocytic filamentous yellow-green algae, in the class Tribophyceae. The vegetative filaments are essentially cylindrical (up to 65 μm in diameter) and of indeterminate length (up to 10 cm in culture). The filaments display a dynamic form of organelle streaming of a "multistriate" type. Nuclear translocation is especially intriguing and involves each nucleus being independently pulled by a bundle of microtubules through the cell. This microtubule bundle emanates from a microtubule-organizing-center (MTOC) next to the primary centriole at the proximal end of each nucleus. This is to report on findings obtained from microtubule bundles along with their associated nuclei through cell homogenation and subsequent centrifugation. Observations of isolated microtubule bundle pellets (with associated nuclei) using transmission electron microscopy will be demonstrated through thin-sections and negative staining of isolated microtubule bundles. Thin sections of isolated microtubular bundles show that the individual contiguous microtubules are connected by fibrous bridges. These bridges are possibly a dynein-like mechanochemical protein allowing the microtubules to slide past each other resulting in a probing action of the microtubule bundle. Negative staining of isolated microtubule bundles reveal a fibrous coating on the peripheral microtubules. This coating might be a kinesin or dynein-like mechanochemical protein responsible for pulling the nuclei through the cytoplasm.

## L. Math & Computer Sciences
## Only Afternoon & Business Meeting
## 1:30 pm, Saturday, May 2, 1992
## College of Business Administration 258
## Dr. Tom Schmidlin, Presiding

**2:00 TEACHING PRECALCULUS WITH GRAPHING CALCULATORS. Antonio R. Quesada, Department of Mathematical Sciences, The University of Akron, Akron, OH 44325-4002**

This on-going study examines the effects of using a graphing calculator on college students' performance in precalculus. Four hundred and twenty-seven participated in the study during the first two semesters. Three experimental groups, representing both large and regular sized sections, were randomly selected from the precalculus sections offered. Students in these experimental groups used a graphing calculator while the students in the control groups used a scientific calculator. On a comprehensive common final exam, the mean of the experimental groups was at least eighteen points larger than that of the control groups. Moreover, in the distribution of letter grades, the percentages of A's, B's, and C's obtained in the experimental groups were considerably larger, while the percentages of D's, and F's were smaller. An analysis of test items found no loss of mechanical skills of the students in the experimental sections.
The results of a survey of the students in the experimental groups seem to indicate that they perceive the graphing calculator as a helpful tool for understanding mathematical concepts, for solving problems, for doing some exploration and experimentation on their own, and for improving their insight on the subject. They would like to use the graphing calculator in their required math courses and would recommend those courses to their friends.

**2:15 INTEGRATING DERIVE IN AN ANALYTIC GEOMETRY/ CALCULUS III COURSE. Monica L. Harrison, Wayne College/The University of Akron, 10470 Smucker Road, Orrville, OH 44667.**

Wayne College, a two year branch campus of the University of Akron, houses a Mathematics/Statistics Center equipped with several IBM compatible computers for which the package DERIVE was purchased. During the Fall Semester 1991, the author integrated lab sessions in the course Analytic Geometry/ Calculus III. Working with the Math/Stat Center co-coordinator, the author organized an introductory session with DERIVE, including authoring expressions, solving equations, integration, differentiation, and graphing in both two and three dimensions. Later in the course, graphing in polar coordinates, partial differentiation, and multiple integration were demonstrated with DERIVE. Students worked in pairs and completed assignments while the author supervised the lab.
The author will describe the dynamics of the lab experience, summarize student reactions (from a survey conducted after the computer experience), and discuss future plans for incorporating DERIVE in the Calculus III course.

**2:30 REGULAR-LIKE EXPRESSIONS FOR ALTERNATING FINITE AUTOMATA. Abdelaziz Fellah, Department of Mathematics and Computer Science, Kent State University, Kent, OH 44242-0001.**

Alternating finite automata (AFA) are a generalization of nondeterministic finite automata (NFA). Although alternating finite automata (one-/two-way, single head) are exactly as powerful as deterministic finite automata (DFA) as far as language recognition is concerned, it has been shown previously that AFA have many theoretical and practical features. In particular, algorithms for transforming a given DFA or an NFA to an equivalent AFA, normal forms and minimization of AFA were investigated. In this paper, we further study alternating finite automata. A new type of system of equations is introduced. Each AFA can be described as a system of equations that has a unique fixpoint, and whose solutions are precisely the regular languages. We present an algebraic approach to AFA, which parallels that of regular expressions and of linear equations. We also explore direct ways of solving such systems and generating equivalent AFA from regular expressions.

**2:45 CORRELATION DIMENSION OF CHAOTIC ATTRACTORS. Thomas Gearhart, Dept. of Mathematics, Capital University, E. Main St., Columbus OH 43209 and Dale Nelson, Advanced Systems Research Group, WL/AAAT -1 Wright-Patterson AFB, OH 45433.**

The concept of fractal dimension provides a means of quantifying the degree of chaos in certain nonlinear dynamical systems by measuring the strangeness of strange attractors associated with such systems. Among the most effective measures of fractal dimension is the correlation dimension introduced by Grassberger and Procaccia. Defined using the statistics of the distances between points of an attractor, the correlation dimension is usually easier to calculate than fractal dimension estimates based on traditional box counting techniques. This paper shows how simple intuitive notions of dimension can be used to motivate the definition of correlation dimension. Efficiency considerations in the implementation of correlation dimension estimation algorithms are addressed. Heuristic methods for obtaining a correlation dimension estimate from inter-point distance data are presented. Results of a correlation dimension analysis of the strange attractors of an infinite dimensional dynamical system are reported.

**3:00 IMPLEMENTATION OF A BACK-PROPAGATION NEURAL NETWORK IN A MASSIVELY PARALLEL SIMD ENVIRONMENT. Josh Farthing,. Box 1583, College of Wooster, Wooster, OH 44691.**

One way to deliver increased computing, power is to have more than one processor working on the task at hand. To date, massively parallel computers, machines with large numbers of processors, have been Single Instruction, Multiple Data (SIMD) configurations. In such a design, a single instruction stream is broadcast to all the processors, each with its own set of data. Except for processors which have chosen to sit idle, all processors execute the same instructions at the same time on their own sets of data. Taking the actions and interactions of biological neurons as their inspiration, artificial neural networks have shown remarkable signal processing ability and adaptability. Unlike a regular computer program, they need not be 'programmed', instead, they can 'learn'. In addition to adapting to the task at hand, neural networks can adapt to minor input variations and network element error or delay. Networks themselves are adaptable to a wide range of tasks, from speech synthesis to composite metal characterization.
As neurons in a biological system can be considered the processors of a massively parallel machine, it is appropriate to simulate neural networks on massively parallel machines. This paper describes the implementation of a simulated neural network trained with the back-propagation rule (described in the paper), in a massivley parallel environment. Analysis of the algorithm is provided.

**3:15 APPLYING GENETIC ALGORITHMS TO ARTIFICIAL NEURAL NETWORK TRAINING. Ashesh Parekh, Department of Mathematical Sciences, College of Wooster, Wooster, OH 44691.**

This project builds upon recent research directed towards the potential use of genetic algorithms for optimizing artificial neural networks. A genetic algorithm (GA) is a general purpose, population-based heuristic search method that imitates some of the processes observed in biological evolution. A neural network can be represented in binary form and the sum-squared error function that is used in the back propagation model of neural

networks, provides an evaluation function for the GA to optimize. These features of neural networks, along with considerations of the superior speed and global search technique of GAs have led to the use of GAs to optimize the set of connection weights in a neural network. It has been observed that genetic algorithms can very quickly find approximate solutions in the weight space, but are typically slow in fine-tuning these solutions [Whitley, 1989]. The purpose of this study is to investigate methods for combining the feature-discovery power of GAs with the training accuracy of the gradient descent method in order to successfully train neural networks. As a first step, we have considered feed-forward networks with just one hidden layer. Training is carried out by alternately applying the GA and the gradient descent rule to obtain the optimal solution in the weight space. The weights from the input to the hidden layer are optimized using a GA, while those from the hidden layer to the output layer are trained using the traditional gradient descent technique. Implementation details and results will be provided in the presentation.

**3:30 MATHEMATICAL MODELLING AND COMPUTER SIMULATION. John Jones, Jr., Air Force Institute of Technology, Wright-Patterson Air Force Base, Dayton, OH 45433 and The George Washington University, Washington, D.C. 20052**

Modelling and simulation of large-scale multidimensional multiparameter dynamical systems require the use of large-scale computers to generate feedback control laws, especially when model uncertainties exist. Now robust control theory is concerned with the problem of analyzing and synthesizing control systems that provide an acceptable level of performance where many model parameters or uncertainties may exist since mathematical models of physical systems are usually never exact due to the presence of such parameters. The need to be able to design robust feedback control laws is very important in such systems. Usually a physical model will have significant structural information about the interconnection of components and subsystems but less information concerning their integrated system performance. Hence, many variations of parameters must be carried out on supercomputers in order to determine the more significant and sensitive parameters which must be adjusted very rapidly to accomplish a desired level of performance.

**3:45 NEW METHOD OF CORRELATION AND REGRESSION ANALYSIS. De Nguyen and Nhung Thi Tran, P.O.Box 81808, Pittsburgh, Pennsylvania 15217**

The purpose of this paper is to introduce a new method for studying a causal relationship between two variables x and y. Let's consider an outbreak of food poisoning in which x represents the levels of toxin and y the number of intoxicated subjects. One has a set of bivariate data $(x_1, y_1),..,(x_n, y_n)$.If x is the cause of the outbreak y, their causal relationship is best represented by a linear correlation of the general form $y = a+bx$ (1). Its representative curve is a straight line. It is known that the mean of many points on this line will be on it. If two points on this line are known, one can draw it. For determining these two crucial points, we divide this set of bivariate data into two groups A and B by a vertical passing through the median point defined by the equation $M = (x_1+x_n)/2$. The mean of group A is $(\overline{X}_A,\overline{Y}_A)$, and that of group B is $(\overline{X}_B,\overline{Y}_B)$. By replacing them in the equation (1), we establish the equation for the slope b:

$$b = \frac{\Sigma y_B - \Sigma y_A}{\Sigma x_B - \Sigma x_A} \qquad (2)$$

Once b is known, a can be calculated and the regression line can be drawn. We define the *degree of confidence* with which we establish the regression line by the following equation : C(%) = 100 - |b'-b|x100 (b'= slope of ideal regression line). The greater C(%) is, the better the established line will be. Our method is simple, accurate, and convenient for a rapid visual assessment of any linear correlation between x and y.

## M. Psychology
## Only Morning
## 9:00 am, Saturday, May 2, 1992
## College of Business Administration 142
## Robert Gandee, Presiding

**9:00 PORTFOLIOS AS AN ALTERNATIVE METHOD OF ASSESSING BEGINNING TEACHER COMPETENCIES. Carole Newman, Vilot Leathers, Lynn Smolen, Isadore Newman and Cathy Butcher. Univ. of Akron, College of Edu., Akron, OH 44325-4205**

There has been considerable interest in identifying and developing improved procedures to assess student competencies at all levels of the educational process. Teacher education is one area that has been targeted as needing to improve assessment of students being certified to teach. Traditionally, it has been assumed that students achieving the highest GPA were the best prepared to teach. A number of researchers (King, 1991; Collins, 1991; Bird, 1988; Scriven, 1988; Scriven, 1988; Shulman and Sykes, 1986; Wolf, 1991) have suggested that a more effective approach for assessing beginning teacher competencies may be the use of *portfolios*, in which students are required to produce documented evidence of their attainment of these skills. Very little comparative research has been done to determine the relationship between the traditional grading procedures and portfolio assessment of student abilities. The purpose of this research is to conduct a preliminary investigation of this relationship and to determine the reliability of portfolio assessment among expert judges.

**9:15 TEACHER CHARACTERISTICS. Ralph F. Darr, Jr., Room 301, Zook Hall, The University of Akron, Akron, OH 44325-4208**

The 1980's were marked by public concern over the apparent deterioration of the educational systems of the nation. Teachers received much of the blame for the poor performance of U. S. students on standardized achievement examinations. One beneficial outcome of this criticism has been heightened interest in identifying the characteristics of effective teachers and teaching. Government agencies, foundations, citizens' groups, and educational researchers have initiated studies of teachers and teaching. This paper presents a synthesis of the major findings and recommendations of these studies as reported in both the professional literature and the popular press. The various research techniques that have been employed in the study of the characteristics of teachers are reviewed. Results from the study of elementary and secondary teachers are presented first, followed by a review of the results from the study of college and university faculty. Recommendations for future research are provided.

**9:30 MODELING DATING ERROR: THE USE OF PARTIAL TEMPORAL INFORMATION IN DATING PERSONAL EVENTS. Laura Shannon, John J. Skowronski, Andrew L. Betz, and Charles P. Thompson. The Ohio State University at Newark, Newark, OH, 43055.**

A number of event dating studies conducted in our lab have yielded a characteristic pattern of dating errors, with "peaks" of error frequency occurring every 7 days. In the present paper, we suggest that this error pattern is caused by subjects' use of several different types of partial temporal information in the process of temporal estimation. More specifically, we suggest that subjects use their knowledge that an event occurred either: (1) on a specific day of the week, (2) on a weekend, (3) on a weekday, or (4) sometime in midweek to construct many of their date estimates. An error probability model is derived from these sources of information, and this model provides a good fit to the data from three separate studies.

**9:45 A STUDY ON DISSOCIATIVE DISORDER OPTIMAL THERAPY: RELATIONSHIP OF TREATMENT VARIABLES TO TREATMENT OUTCOME FACTORS. Dr. Moshe Torem, Akron General Medical Center; Lynn W., Cincinnati, Ohio; Patricia Pallotta and Dr. Isadore Newman, University of Akron Office of Educational Research and Evaluation, Akron, OH 44325-4208.**

The purpose of this study is to examine the relationship between treatment variables and treatment outcome of 425 patients who completed a self-report questionnaire. The treatment variables include demographics, nature and personality of therapist, nature and focus of therapy, and expectations. Seven distinct outcome factors were extracted from a 25 item symptom relief list: 1) restoration of hope & self esteem; 2) reduction of PTSD symptoms; 3) improved personal safety; 4) reduced anger & rage; 5) alcohol & drug free; 6) physical health improvement; and 7) start dating again. The treatment variables were analyzed using multiple linear regression. Individual and sets of predictive variables were identified (Nature of therapist; demographics; use of medications, abreactions, play and phone contact; and therapist affiliation) that account for significant amount of unique variance in predicting overall satisfaction in treatment and 5 of the outcome variables identified by the previous factor analysis.

**10:00 A MODEL OF STUDENTS' MOTIVATION AND THINKING. R.C. McClendon & I. Newman. College of Education, Department of Educational Foundations, The University of Akron, Akron, OH 44325-4205.**

To improve teaching and learning at the post-secondary level of education, researchers are using the Motivated Strategies for Learning Questionnaire (MSLQ). This instrument, based on the information-processing model of cognition (Pintrich, 1988), was administered to 800 college students enrolled in an educational psychology course. Data were factor analyzed to test for construct validity of the instrument and to reveal common factors related to students' motivation and learning strategy use. Results will contribute to construction of local norms useful in diagnosis of teaching and learning problems. Research also has implications for student retention, improved teaching, and increased knowledge of student motivation and cognition.

**10:15 A COMPARISON OF BEHAVIORAL RIGIDITY BETWEEN TRADITIONAL AND NON-TRADITIONAL COLLEGE STUDENTS. Paul E. Panek, Christie Partlo, & Nanette Romine. The Ohio State University at Newark, University Drive, Newark, OH 43055**

The Test of Behavioral Rigidity (TBR) was administered to a group of Traditional (age ≤ 22 years; N=90, M *age* = l9.16 yrs., SD= 0.96) and Non-Traditional college students (age ≥ 25 years; N= 39, M *age* = 34.85 yrs., SD= 7.53) to determine if there were significant differences in rigidity between the groups. Results indicated significant differences between the groups on Personality-Perceptual Rigidity and Composite Rigidity Quotient, in favor of the Non-Traditional students being less rigid (more flexible). Within each group, females were found to be significantly less rigid (more flexible) on Psychomotor Speed and the Composite Rigidity Quotient. Results argue against the belief that Non-Traditional college students find it difficult to adjust readily to new situations and tasks, and that rigidity increases with age. Further, within both groups of students females were more flexible than males. Implication of the results for higher education were discussed.

**10:30 THE ROLE OF UNIONS IN THE CURRENT ECONOMIC AND POLITICAL CRISIS. Robert Deitchman, Ph.D. School of Social Work, The University of Akron, Akron OH, 44325-8001.**

An increasing availability of only minimum wage jobs, higher unemployment, the exportation of jobs, job insecurity, increased privitization of public sector service jobs, increased costs in employee share of health care costs, loss of dignity, loss of security regarding retirement pensions, loss of independence and lack of input into the work environment are all indicators reflective of the current economic and political crisis. Many public service employees have to this point resisted becoming part of labor force organizations to protect their own best interest. Economic controls to a large extent have been left to management and operators rather than with individual workers/employees. How many unions will survive the current economic downturn is unclear. A thesis will be presented along with the basis for it, which holds that there will be increased labor agitation in institutions that comprise the public sector (including but not limited to universities and colleges) with a resulting increase and commitment by a disgruntled workforce in union organization and in bringing about change in the political and social institution as they currently exist.

**10:45 PMS SYMPTOMS AS A FUNCTION OF BETA-ENDORPHIN WITHDRAWAL. A.J. Giannini, D.M. Martin, A.M. DeCapua, P.O. Box 2169, Youngstown, OH, 44504.**

Fifty-three women who met DSM III R criteria for late luteal phase disorder were studied. All ranged in age between 21 and 32. Thirty-five where white, one was Oriental, and seven were black. All signed consent forms to participate in the study. Responses were measured by Brief Psychiatric Rating Scale and a daily caloric intake diary. Serum levels of ß -endorphin were measured on the first, tenth, fifteenth, twentieth, and twenty-fifth day of each of two menstrual cycles. Twenty-one women had significant decline in ß-endorphin ($p < 0.02$) on the twentieth day as compared to 32 women without ß -endorphin decline. This drop was associated with increased anxiety ($p< 0.01$), increased physical discomfort ($p< 0.01$), decreased concentration ($p <0.01$), and increased caloric consumption ($p <0.05$).

## M. Psychology
## Only Afternoon & Business Mtg.
## 1:30 pm, Saturday, May 2, 1992
## College of Business Administration 142
## Robert Deitchman, Presiding

**2:00 THE INFLUENCE OF SINGING GROUPS ON THE BEHAVIOR OF PERSONS AFFLICTED WITH ALZHEIMER'S DISEASE. Carla Kadavy & Robert Gandee PhD., Slippery Rock University Gerontology Program, 216G- BSB Slippery Rock, PA 16057**

The importance of singing therapy in the treatment of Alzheimer's disease is frequently noted in much of the Alzheimer's literature but actual research studies which support these claims are minimal. Information obtained from music studies with Alzheimer's patients can assist family caregivers as well as professionals who work with this special population group in long term care settings. More evidence of singing programs and their successes can also assist program planners with the development of more effective treatment interventions. A treatment program which involves music may result in increased socialization, decreased agitation, anxiety and depression as well as prolonged deterioration from the disease. Previous singing studies with individuals who exhibit marked memory loss have revealed increased verbalization and socialization among peers. Music programs such as singing are encouraged to reinforce the effectiveness of such interventions with Alzheimer's patients and to promote the continued use of music with this population. This presentation will discuss specific singing interventions and outcomes used with stage two Alzheimer's patients in a long term care facility.

**2:15 AGE AND GENDER DIFFERENCES IN LOVE STYLES. Robin Butler and John J. Skowronski. The Ohio State University at Newark, Newark OH, 43055.**

Using a taxonomy proposed by Lee (1973), Hendrick & Hendrick (1986) developed a personality instrument desgined to measure the six different "styles" of love. This instrument was given to subjects at the Ohio State University at Newark.Results replicated the data of Hendrick & Hendrick, indicating that males and females score differently on the different subscales of the test. For example, females score higher on the scales measuring Storge (friendship love) and Agape (selfless love), while males score on the scale measuring Ludus (game-playing love). However, in contrast to the results of Hendrick & Hendrick, but consistent with other work in aging, we found significant age effects on several of the subscales. For example, older people were likely to score higher on scales measuring Agape (selfless love). Results are discussed in terms of cultural and maturational factors affecting approaches to love.

**2:30 FURTHER VALIDATION OF A TWO-ITEM INDEX OF THE QUALITY OF HYPNOTIC EXPERIENCES. George W. Handley and Roger A. Page, The Ohio State University at Lima, 4240 Campus Drive, Lima, OH 45804.**

The Harvard Group Scale of Hypnotic Susceptibility (HGSHS), a 5-point (12-item) Realness Rating Scale (RRS), a 7-point Pleasantness Scale (PS), and the 38-item Field Depth Inventory (FDI) were all administered to 416 undergraduates. When combined with a previously reported sample, the total sample size is 689. Pearson correlations (based on the total sample) for the HGSHS with the RRS, PS, and FDI were .65, -.37, and .65, respectively, while the FDI/PS correlation was -.50. These are very close to the previous correlations of .63, -.36, .66, and -.51, respectively. The arm and eye catalepsy items pooled (from the RRS) produced a correlation with the HGSHS of .61. (This is nearly as high as a correlation of .64 for the remaining ten items of the RRS with the HGSHS!) The correlation between these two items and the PS was -.35, similar to the HGSHS/PS correlation, suggesting that both the HGSHS and the catalepsy items are tapping a "pleasantness" dimension to the same extent. A correlation of -.37 between the RRS and the PS would suggest that realness and pleasantness are separate dimensions. The two catalepsy items combined would appear to produce a good index of quality of hypnotic experience that correlates well with hypnotic susceptibilty and other measures.

**2:45 TIME FRAME INSTRUCTIONS AND MEASURES OF AFFECT. Sara Staats, Jayne Holzapfel, Tamara Morris, and Chrisite Partlo. The Ohio State University at Newark. Newark, OH 43055**

The relative distinctions between state and trait measures of emotion are addressed in this study. In sample one, several representative measures of emotion are presented first with "How do you usually feel?", and then with "How do you feel now?" instructions (N=70). In sample two, the same representative measures of emotion are presented with "How do you usually feel?", and then with "How will you feel five years from now?" instructions (N=75). A check list measure of positive and negative affect, the PANAS (Watson, Clark, & Tellegen, 1988) that purports to measure trait emotion and a feeling descriptor, affect balance type of scale (Warr, Barter, & Brownbridge, 1983; Staats, l989) that was expected to strongly reflect state, yielded similar results. Usually, now, and future instructions do not produce different scores on negative affect. Usually and now instructions produced similar scores on positive affect, and these scores are lower than the scores produced by future instructions. Thus, state/trait differences are notable in positive but not in negative traits. Although, this result is consistent with a body of research showing that positive affect may be altered more readily than negative affect, it suggests the need of reconceptualization of state/trait relationships.

**3:00 MOOD MANIPULATION: STATE, TRAIT, AND COGNITIVE CONSIDERATIONS. Sara Staats, Christie Partlo, Tamara Morris, and Jayne Holzapfel. The Ohio State University at Newark, Newark, OH 43055.**

Several broad divisions of behavior are frequently accepted. Trait versus state, cognitive versus emotional, and positive versus negative affect are common divisions. Trait, or relatively broad enduring characteristics, are often contrasted with state or relatively narrow fleeting characteristics of behavior. Cognitive behavior is often separated from emotional behavior and emotional behavior is frequently partitioned into positive and negative feelings. There is considerable disagreement as to the nature of these categories and how they should be measured. The present research hypothesizes that measures most sensitive to mood manipulation assess state aspects of behavior and that those measures not sensitive to mood maipulation are possible candidates for trait measures. Two measures of mood, the PANAS (Watson, Clark, & Tellegen, 1988) and a version of the Affect Balance Scale (Staats, 1989) were administered to persons following a positive, negative, or neutral mood manipulation. Results showed that the positive affect scale of the PANAS was affected. (F[2.173] = 5.66, p ,01), suggesting that this scale measures state rather than trait affect. Further analysis, within the PA Scale of the PANAS, revealed interesting differences, suggesting that the PANAS may be assessing various dimensions of behavior rather than being a pure measure of positive affect.

**3:15 IMPRESSION FORMATION IN DEPRESSED VS. NON-DEPRESSED SUBJECTS. Misty Amacher, John J. Skowronski, Andrew L. Betz, and Katherine Gannon. The Ohio State University at Newark, Newark, OH 43055.**

Recent research by Weary and Gleicher (1991), as well as others, suggests that depressed people might have less confidence than non-depressed people in the impressions that they form of others. One of the implications of this idea is that depressed subjects should be more prone to recency effects in impression formation than non-depressed subjects. An experiment was conducted in which the behaviors of hypothetical others were described, and subjects were asked to report their impressions of the targets based on these behaviors. The results were consistent with the hypothesis. Both for judgments of honesty/dishonesty and intelligence/stupidity, subjects classified as depressed (score of 10 or more on the Beck depression inventory on two separate occasions) were more influenced by the last behavior in a set than non-depressed subjects. Interestingly, this tendency did not depend on whether this final behavior was diagnostic or was neutral.

**3:30 RESPONSE TIMES AND REPEATED TRAIT JUDGMENTS: EVIDENCE FOR PROCESS SPECIFICITY. W. Richard Walker, John J. Skowronski and Jaron Shook. The Ohio State University at Newark, Newark, OH 43055.**

In four separate experiments, subjects were asked to make timed trait judgments about hypothetical targets. The results of these four experiments show that trait judgments were speeded when the initial judgment was repeated (e.g., kind-kind) or when the initial judgment was a synonym of the subsequent judgment (e.g., nice-kind). Response times were not speeded when the initial judgment was an antonym of the subsequent judgment (e.g., mean-kind). These data suggest that, consistent with Smith's work on proceduralization of judgments, the mental processes that are activated when making a trait judgment are specific to the construct involved. These data further suggest that opposing trait concepts are not strongly linked in the mental network.

**3:45 IS THE PRESENCE OF OTHERS A CAUSE FOR INCREASED A-STATE IN ADOLESCENTS? MacCracken, M., U Akron, Akron OH 44325 & Stadulis, R., Kent State 44242.**

In a 10-year research review, Stadulis & MacCracken (1990) reported peer spectators and coactors may cause changes in children's balance performance dependent upon the task. The present study purports to discern if the presence of others may cause changes in adolescent's underlying feelings of competitive anxiety. To prompt different A-state levels in the same chlld, balance settings varied from more threatening (performing before peer spectators), to less threatening (performing paired) to least threatening (performing alone). Children (*N*=109) aged 12 (n=38), 14 (n=35) and 16 (n=36) had A-state assessed by Martens' (1977) CSAI in the context of walking a 1' high, 2" wide balance beam twice forward, twice backward. A-state was assessed 3 times: before first trial walking forward, before first trial walking backward, after all four trials. These same children were tested in similar manner 2 and 4 years later. **Results** revealed: A-state before backward walk was greater ($p<.05$) than before forward walk, A-state after 4 test trials decreased substantially (M=17.2) in all 3 settings over all years. Further over all years and ages, spectator setting (M=21.2) resulted ($p<.05$) in highest A-states with coaction (M=19.2) producing a higher A-state than alone (M=18.4). Thus, findings support the presence of others, particularly spectators, as a cause for increased adolescent anxiety.

**4:00 GROUP REMINISCENCE ACTIVITY IN SENIOR CENTERS Lucille M. Tabler, Robert N. Gandee, and Paulette A. LaDoux, 216 G, B.S.B., Gerontology Program, Slippery Rock University, Slippery Rock, PA 16057.**

The purpose of this study was to compare the influence of reminiscence and current topic discussion on depression and life satisfaction among healthy older adults attending Senior Centers in Butler County, PA. A total of 33 participants were involved in this study and were sub-grouped by three Senior Centers, Reminiscence Group (I) (n=10), Current Topic Discussion Group (II) (n=9) and Control Group (III) (n=14). Reminiscence and Current Topic Discussion sessions were conducted for a duration of 60 minutes/week over a five-week period. Pre- and post-testing was conducted utilizing the Beck Depression Scale and the Life Satisfaction Index. Statistical analysis of data using the Wilcoxin Signed-ranks Test showed significant improvement in life satisfaction in both (I) and (II). The depression scale did not reflect any significant change. Additionally, a negative correlation was identified between life satisfaction and depression. These data have implications for planning and implementing programs for older adults who participate in community Senior Centers.

## N. Junior Academy
## Only Morning
## 9:00 am, Saturday, May 2, 1992
## College of Business Administration 121
## Rebecca Spore, Presiding

**9:00 THE EFFECTS OF SEASONAL CHANGE ON THE PRODUCTION OF USNIC ACID IN THE LICHEN *CLADONIA CRISTATELLA*. Amy M. Elfner. 29 Darlington Road,. Delaware, OH 43015.**

When lichens develop, certain chemicals such as acids and pigments are produced. Lichen acids, many of which have been identified, not only affect the substrate which they are on but some also are used as antibiotics. One of the best known products of lichens is usnic acid, which is unique to lichens and does not synthesize in cultures of the isolated fungus. According to M. Ghione, and co-workers (*Chemioterapia* **1988**, 7, 302-305.) usnic acid is antibiotic toward *Streptococcus mutans* which produces oral plaque. The objectives of this project are to determine if seasons have an effect on *Cladonia cristatella* production of usnic acid, where in the lichen the acid is produced, and in which part of the lichen the most acid is produced. The hypothesis is that there may be an effect of seasonal change

on the production of the usnic acid, and that there will be more usnic acid found in the apothecium of the lichen. Methods of thin-layer chromatography (TLC), optical spectrophotometry, mass spectrometry, and high performance liquid chromatography (HPLC) are being to be used in conducting the experiments and for evaluating results.

**9:15 IDENTIFYING HOUSEHOLD MUTAGENS USING THE AMES TEST**
**Margie Lhamon, 1126 State Street, Lima, OH 45805**

The Ames test was used to test the mutagenicity of several household chemicals: caffeine, nicotine, hydrogen peroxide, the herbicides RoundUp and KleenUp, and the hair dyes Clairol Nice 'n Easy Color No. 120, Clairol Balsam Color No. 612, and L'Oreal Performing Preference No. 5. The Clairol dyes were tested both before and after mixing with a peroxide solution. The Ames test is a quick and accurate mutagenicity assay using mutant strains of *Salmonella typhimurium*. These strains carry a genetic deficiency causing them to lack the ability to produce histidine, an amino acid essential for growth. The bacteria are incubated on minimal medium with a test article. If the test article is mutagenic to the bacteria, the bacteria will mutate and grow on the minimal medium. *S. typhimurium* strain TA 1535 detects mutagens that cause substitution mutations, while TA 1538 detects frame-shift mutations. Several concentrations of each test article were tested. Nicotine, Clairol Nice 'n Easy Color No. 120 unmixed dye, Clairol Balsam Color No. 612 mixed as well as unmixed dye, and L'Oreal Performing Preference No.5 unmixed dye displayed mutagenic activity in these studies. In contrast, caffeine, hydrogen peroxide, and the herbicides displayed no mutagenicity. Clairol Nice 'n Easy Color No. 120 mixed dye was cytotoxic at the concentrations tested, making its possible mutagenicity undetectable.

**9:30 COMPARATIVE EFFECTIVENESS OF VARIOUS ANTIBIOTICS.**
**Jason L. Johnston, 25162 Ridge Rd., E. Rochester, OH 44625**

The effectiveness of six antibiotics was tested against four microbes over a fourteen month period. The antibiotcs used were cefoxitin, chloram phenicol, gentamicin, penicillin G, trimeth/sulfa, and tetracycline. The microbes these antibiotics were tested against were Klebsiella pneumoniae, Escherichia coli, Staphylococcus aureus and Streptococcus Group D Enterococcus. After completing data collection, evaluation of microbe resistance development, over the fourteen month period, was evaluated. Klebsiella pneumonia remained sensitive to cefoxitin, chloramphenicol, gentamicin and trimeth/sulfa, and resistant to penicillin G. Resistance to tetracycline was developing. Escherichia coli remained sensitive to cefoxitin, chloramphenicol, gentamicin, and trimeth/sulfa, and demonstrated unchanged resistance to penicillin G. Resistance to tetracycline was beginning to develop. Staphylococcus aureus remained sensitive to cefoxitin, chloramphenicol, gentamicin, trimeth/sulfa, and tetracycline. Resistance to penicillin G appeared to be developing. Streptococcus Group D Enterococcus remained intermediate to penicillin G and resistant to cefoxitin, gentamicin, and tetracycline. Possible resistance to chloramphenicol and trimeth/sulfa was developing. During the thirteenth month of the experiment, it was thought that a cefoxitin resistant strain of Escherichia coli had developed. Further experiment identified that the antibiotic-impregnated agar had become contaminated with a species of Bacillus.

**9:45 THE ANALYSIS OF SURFACE WATER AND GROUND WATER IN NORTH-EASTERN OHIO FOR VOLATILE ORGANIC COMPOUNDS CONTAMINATION.**
**Kimberly A. Ellis, 1081 E. Garfield Road, Aurora, OH 44202-9733**

Numerous samples were taken from homes and businesses in North-Eastern Ohio that receive water from surface water sources. These sources were the Cuyahoga River and Lake Erie. Also, numerous samples were taken from well water sources. The well water sources were equal in number to the number of samples taken from the surface water sources. The prime purpose of this research is to determine if surface water sources contain higher levels of contamination from Volatile Organic Compounds (VOC), when compared to well water sources. The Hypothesis being that the surface water sources would have higher levels of contamination due to the open exposure to contaminates. Samples were then collected and tested for VOC's. The samples were submitted to a lab specializing in water and soil analysis. The procedure used was gas chromatography with the purge and trap method. To verify the results and findings, a mass spectrometer was used. Due to the extent and nature of this research results are not available until March 1992.

**10:00 SPECTRAL SUBTRACTION AS A TOOL IN THE ANALYSIS OF FOURIER TRANSFORM INFRARED SPECTRA.**
**Matthew Paschke, 1013 Liberty Lane, N.W., North Canton, OH 44720**

In this novel method of spectral analysis, the Nicolet Fourier Transform infrared spectroscopic database was used as the basis of searches for molecules containing a given substructural unit. A search was conducted for compounds containing the methoxy group, and another was conducted for compounds with a phenyl ring. The resultant spectra were then averaged, and a background spectrum was subtracted from this average. The difference spectra were highly reliable and significantly clearer than individual spectra. These spectra exhibited clear peaks and a high dynamic range. Several expected peaks were found in the difference spectra, as well as new peaks. High reproducibility is evidenced by the fact that expected peaks appeared in all examples of the search structures, and by the fact that those peaks which did appear show a low standard deviation for the peak center. The high reproducibility rate of the spectral peaks show that the clearer difference spectra are a valid resource tool.

**10:15 PRELIMINARY STUDY OF ALZHEIMER'S DISEASE PATIENT IMPAIRMENT AND CAREGIVER KNOWLEDGE OF ALZHEIMER'S DISEASE AS PREDICTORS OF CAREGIVING STRESS.**
**Stacey Rychener, 1709 Crestwood Ave., Defiance, OH 43512.**

The present investigation examined the level of Alzheimer's Disease (AD) patient impairment and caregiver's knowledge of Alzheimer's Disease as predictors of caregiving stress. Caregiving stress was conceptualized as hassles or the minor day-to-day events in caregiving (Kinney & Stevens 1989). Data were collected from twenty-two dyads consisting of a person impaired with AD and his/her spouse. These couples were paticipating in longitudinal investigation of stress, appraisal, and the overall effects of caregiving. The care-recipients' degree of cognitive impairment was assessed using the Demetia Rating Scale (DRS) (Mattis, 1973). The Alzheimer's Disease Knowledge test (ADK) (Dieckman, Zarit, Zarit, & Gatz, 1988) was used to test caregivers on their knowledge of AD. Based on care-recipients' DRS score, couples were placed into either a high or a low impairment group. The degree of stress reported by the caregivers in each group was then compared. It was hypothesized that the higher the level of patient impairment, the greater the amount of distress a caregiver would report. Similar comparisons were made pertaining to the amount of knowledge the caregiver had of AD and the degree of stress reported by the caregiver. It was hypothesized the more knowledge a caregiver had of AD the fewer hassles they would report. Results indicated that caregivers of more impaired spouses experienced significantly greater degrees of caregiving stress. When caregiving stress was examined as a function of caregiver's knowledge of AD, the results revealed that the high knowledge group experienced significantly fewer hassles. The latter finding seems especially important because it has significant potential to help spousal caregivers.

**10:30 Currents Of Death II. Carissa Begue. 11339 Lippincott Rd. East Rochester, OH 44625**

In this second year investigation, the researcher studied the effects of electromagnetism on *Drosophila melanogaster*. The experiment was done with intentions of clarifying the need for concern relating possible health risks of electromagnetic exposure. The fruit flies were exposed to different amounts of electromagnetism at varying amounts of time. The exposure began at twenty-five coils of copper wire at 12 hours daily to constant exposure of five hundred fifty coils. The amount of time for maturation to produce a generation was recorded daily. The researcher found that the length of time for maturation was directly influenced by the intensity of the magnetic field strength and the duration of exposure. Also affected, were the number of offspring produced in the $F_1$ generation.

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## N. Junior Academy
## Only Afternoon & Business Mtg.
## 1:30 pm, Saturday, May 2, 1992
## College of Business Administration 121
## Amy Elfner, Presiding

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**2:00 CAN A FOUR DIMENSIONAL HYPERBIRD'S FLIGHT BE SEEN IN THREE DIMENSIONAL SPACE?: EXTENDING LOGO'S 2D TURTLE GRAPHICS TO A 4D HYPERBIRD GRAPHICS SYSTEM.**
**Jonobie Dale Baker, 5525 Allyn Road, Mantua, OH 44255.**
**(Kent Roosevelt High School, Kent, OH.)**

The programming language LOGO provides a two dimensional turtle graphics system, enabling a user to move a turtle in the plane and see the path of the turtle projected onto a computer monitor. This project extends LOGO's two dimensional graphics to four dimensions by building upon the author's former three dimensional extension to LOGO. Through a three dimensional window into four dimensional Euclidean space, a four dimensional hyperbird's interactive flight is projected onto a computer screen. To build the system, the author mathematically had to derive the necessary four dimensional equations for the in-flight rotations centered at the hyperbird. The system is programmed in Apple IIc LOGO. (This work was the author's 1991 Ohio Science Fair project done while she was in grade 9.)

**2:15 E-MAIL: DOES IT DEHUMANIZE. Susan Norfolk, 6612 Brock St., Dublin OH 43017.**

Does the use of electronic mail tend to dehumanize the working place? Various quantitative studies used to cost justify the use of electronic mail have not taken into account the subjective or qualitative dimension of the question. Through the use of three surveys, this study measured responses to various qualitative questions concerning social and political relationships within a single company. These surveys measured attitudes toward electronic mail, impact of electronic mail, and appropriateness of electronic mail. The statistical analysis of the results of all three surveys strongly indicates that electronic mail has neither a positive nor a negative impact on social or political relationships. All three survey results point to a strong feeling of the usefulness of electronic mail. Yet, the data from all three surveys indicate that electronic mail does not dehumanize a company. The attitude survey data showed an expressed "human" feeling that face to face is better than electronic mail. The impact survey data suggested that electronic mail has very little, if any, impact on human relationships within the company. Finally, the appropriateness survey presents a decisive view that electronic mail is inappropriate for the forms of communication requiring true human interface.

**2:30 CRANKING OUT POWER WITH MARMEM ENGINE. Mike Ruthemeyer, 5695 Nickview Dr., Cincinnati, OH 45247.**

The martensitic memory (MarMem) of specific alloys has amazed many people with their ability to remember shapes after being deformed. However, most people fail to recognize the major importance of such a recovery. Marmem has the ability to convert heat energy into mechanical energy at the macromolecular level. The advantage of Marmem heat conversion is, therefore, its unique ability to turn small amounts of thermal energy into a more useful mechanical energy. The purpose of my project is to develop a marmem engine which can convert thermal energy into mechanical energy. To begin, I studied the principles behind previous marmem engines. Unsatisfied with the present engines, I designed my own. I hoped to use the direct force of the alloy's recovery to rotate two cam-shafts. The two camshafts would rotate opposite of each other through a gear connection. Above the cam-shafts axis, the alloy would be heated, and below it would be cooled. Therefore, on the heated side the shape memory alloy would contract forcing the cam-shaft to rotate inward, while on the bottom side the shaft would rotate outward due to a secondary phenomenon called two-way memory. With this constant heating and cooling of the extremities the axle will continuously rotate. The engine was constructed and found to slowly rotate. The new engine design proved to work and eliminated some of the earlier engine's deterrents.

**2:45 PROGRAMMABLE ROBOTICS CONTROL SYSTEM. Joshua Jackson,23256 Rinker Rd., Minerva, OH 44657**

This project has been designed as an attempt to create a more "user friendly" way of controlling robotic equipment. The design also includes an experimental method of controlling as well and position sensing of the drive motors on the robotic arm itself. The control system consists of 7 major components. The first of these is a digital to analog converter (DAC). The DAC used in this project uses eight input bits to provide a total of 256 separate analog voltages. It receives these bits from the first parallel port and converts them to their analog equivalent. This voltage is then passed to the window comparator, whose function is to determine whether a motor is in the correct position. The motors themselves have been equipped with a series of operation amplifiers (Op-Amps) that are set up as voltage follows. By mounting a potentiometer in the pivot point on the arm an analog voltage can be determined and referenced to the voltage from the DAC. The other of the seven components include an analog multiplexer and demultiplexers, which receive output from the second parallel port, for selecting the motor to operate and for passing the correct sensor voltage to the window comparator, buffered relay drivers for supplying the motors with electricity, and of course the program, written in a combination of Microsoft QuickBasic and assembly language for entering and carrying out functions.

**3:00 THRUST OF A REMOTE CONTROL AIRPLANE WITH SEVERAL PROPELLERS. Mark T. McCanney, 3044 Carters Corner Road, Sunbury, OH, 43074**

Thrust versus rpm was measured on a 0.46 cubic inch engine for five different propellers (7x6, 9x4, 10x6, 10x7, 12x6). The measurements were made on the aircraft, suspended from sawhorses to eliminate friction. Fuel consistency was monitored by checking specific gravity. Engine rpm was measured using a photocell tachometer. Thrust was measured using a calibrated fishscale attached to the tail. Measurements were made with the plane facing into the wind, with a maximum headwind of 5 mph. Air temperature and humidity were recorded to check for air density effects. Extra glow-plugs were on hand to maintain a constant engine performance. Results were surprisingly understandable. Each propeller has a plot of thrust versus rpm which is smooth and curving upward. The smaller propellers create more rpm's but less thrust and the larger propellers have a lower rpm but create more thrust. The 10x6 propeller created the most thrust (5.3 lbs) at 13,300 rpm. The 7x6 propeller created the most rpm's at 15,000, yet it had the lowest thrust (2 lbs). This project answered the question of which propeller produces the most thrust but created many others. Would the results be different if the plane were flying? How would a different fuel change the results? How does airfoil theory explain the results? Can the plane be instrumented to make thrust, rpm and airspeed measurements in the air? Can the instruments be extended to a guidance system enabling the plane to fly a route without human control? What kind of skin would reduce drag?

**3:15 THE EFFECT OF AIRFOIL SHAPE AND ANGLE OF ATTACK ON LIFT & DRAG. Marriott, Darin, 1276 Lomeda Ln., Beavercreek, OH 45434.**

My project involved a four year study to investigate low-speed airfoil flow dynamics. Phase I: Built first open end wind tunnel with one axis balance to test variation of lift with aspect ratio for a typical subsonic airfoil profile. Phase II: Totally redesigned and rebuilt a second open end wind tunnel with a one-axis balance to test variation of lift as both the thickness and the point of maximum thickness on the air-foil was varied. Phase III: The wind tunnel was refined and a new two-axis balance was added in order to study the variation of lift to drag ratio of half-diamond wings as the point of maximum thickness was varied. Each airfoil section was tested at thirteen different angles of attack to obtain lift, drag, and lift to drag ratio curves. Phase IV: Totally new tunnel and electronic measuring devices were implemented. The object was to measure lift, drag, and torque on two dimensional quadrilateral airfoil sections.

## N. Junior Academy
## Poster Session
## Saturday, May 2, 1992
## College of Business Administration Concourse

**BOARD A**

**4:00 DO CERTAIN CHEMICALS, WHEN ADDED TO AN OIL SPILL, AFFECT THE VISCOSITY OF THE OIL? Christine Baker, 4710 Seville Drive, Englewood, OH 45322**

Oil spills have greatly affected the environment for the past twenty or thirty years by ruining beaches and killing marine life. An oil spill is difficult to clean up, because when oil spills it spreads out. The purpose of this experiment is to alter chemically the properties of oil to make it easier to clean up. Thickening the oil, without making it heavier than the water, would make an oil spill much easier to clean up. In this experiment, chemicals were added to oil and water to change the oil's viscosity. The materials used were five glass jars, motor oil, hydrochloric acid, calcium chloride, sulfuric acid, and potassium iodine. The procedures were to fill five jars with 250 ml of water and 150 ml of oil; observe the reaction of chemicals in the oil after two days; perform procedure to determine the viscosity of each of the five jars. Two of the chemicals, calcium chloride and hydrochloric acid, made the oil thicker, while the other two made it thinner. None of the chemicals made the oil heavier than water. This experiment was a success in proving that chemicals do affect the viscosity of an oil spill and, therefore, would make the clean up of an oil spill easier.

**BOARD B**

**4:00 MUSIC AND HOMEWORK. Syna Kuttothara, 327 Oak Court, Loudonville, OH 44842.**

In this work I wanted to find out if music would have any effect on student's ability to learn. If so, I wondered if there is a difference between the effects of loud versus low volume music. My hypothesis is that loud heavy metal type music is not conducive to learning, while doing homework. It is based on recent reports on the adverse effect of loud music on hearing and recent memory. In the experiment, 7th grade classmates of mine were exposed to reading scientific material at their level of understanding without music, with classical music, and with heavy metal type music. They were observed for their attention span and speed of reading. They were tested for their ability to learn and recall what they learned. My conclusion proved my hypothesis to be correct. Students learn at best in quiet surroundings without any music. If needed, soft classical type music is the best. Loud heavy metal type music (over 100dB) while doing homework shortens students attention span. It encourages students to read faster, decreases comprehension, and interferes with the students ability to recall what was learned. Thus loud music has a very negative effect on the student's ability to learn while doing homework.

**BOARD C**

**4:00 THE CASE AGAINST BAR SOAPS. Reid Perala, 600 Eastwood St., Geneva, OH 44041**

Five commonly used liquid soaps were tested to determine their effectiveness as antimicrobial agents by culturing bacteria from my hands in petri dishes before and after washing with each test soap and comparing the amount and type of bacterial growth. My procedure included sterilization, contamination, inoculation, disinfection, reinoculation and incubation using strict controls. Using the same procedure five commonly used bar soaps were tested simultaneously with the most effective liquid soap. Each of the bar soaps showed decreasing effectiveness in removing bacteria in each successive trial while the effectiveness of the liquid soap remained constant. I concluded that the decrease in effectiveness might result from contamination of the bars with bacteria during normal use, proving bar soaps to be an ineffective method for disinfection of skin surfaces. To prove my hypothesis that washing with in use bars may actually contaminate skin surfaces with microorganisms deposited on the bars during previous use, I cultured bacteria from in use bars and also from my hands before and after washing with the bars at regular intervals over the life of the bars. My hypothesis was supported by the finding that bacteria was present in increasing amounts on my hands after washing with the in use bars.

**BOARD D**

**4:00 WATER QUALITY IN THE ATWOOD LAKE REGION Caruthers, H., Conley, A., Bugh, T., Rosenberg, D., Miller, K., Mullins, L., Peters. S., Lepar, M. McKinley Sr. High School, 2323 17th St., Canton, OH 44708**

A water quality study of the Indian Fork River in the Atwood Lake Region was conducted by a student group on October 18-19, 1991. The study was designed to compare the water quality at an inflow and an outflow site. Determination of water quality was based primarily on the presence of accepted indicator insects, specifically caddisflies, stoneflies, and mayflies. The water was tested for concentration of dissolved oxygen and carbon dioxide, hardness and pH. Samples were taken from the stream bed, underneath rocks and leaves, and from the water surface. Organisms from the inflow site include the following: Agrypnia, Alloperla, Perlesta, Tricorythodes, Spirogyra, Oscillatoria, Lemna, Dugesia tigrina, Cambarellus, Elliptio, Gyrolus, Plectus, Aelosoma quaternarium, and several species of zooplankton, phytoplankton, and rotifers. Organisms from the outflow site included the following: Agrypnia, Callibaetis, Nitelle, Lyngbya, Spirogyra, Botryococcus braunii, Dugesia tigrina, Gyrolus, and several species of zooplankton and phytoplankton.
Results of the chemical analysis of the inflow water samples were as follows: pH 7.0, $O_2$ 16.0 mg/l, $CO_2$ 9.9 mg/l, hardness 39.4 mg/l.
Results of the chemical analysis of the outflow water samples were as follows: pH 7.4, $0_2$ 16.4 mg/l, $C0_2$ 5.8 mg/l, hardness 40.5 mg/l.
According to accepted standards, the presence of caddisflies, stoneflies, and mayflies indicates "excellent" water quality, while the presence of caddisflies and mayflies indicates "good" water quality. Our data indicates "excellent" water quality at the inflow site and "good" water quality at the outflow site. Also supporting this conclusion is the wider diversity of species at the inflow site, compared to the outflow site.

**BOARD E**

**4:00 THE EFFECTS OF TIME COMPOSITING FROM GEOSYNCHRONOUS ORBIT ON INFRARED TEMPERATURE AND MOISTURE PROFILE SAMPLING IN A CONVECTIVE SITUATION. William A. Hope, 11820 W. Hall Rd., Laura, OH 45337.**

The value of time compositing for increasing the coverage was tested for a convective outbreak case on May 4, 1990 over the eastern U.S. Visible GOES imagery was used to outline clear areas at hourly intervals by two independent analysts. The clear areas were identified each hour either downstream of existing convection or in areas where convection might be expected later in the day. Time compositing was done every three hours (1330-1530) and (1630-1830) and over the full five hour period. A significant increase in coverage was measured with each three hour compositing (about a factor of 2) and a further increase over the full period (about a factor of 3). The regions where the clear area analyses were done were subdivided into 1/2 latitude and longitude boxes and if some portion of each box was clear, it was assumed that at least one profile could be obtained within the box. In the largest clear areas at least some portion was clear every hour. Even in the cloudier regions multiple clear looks were possible during the entire period.

**BOARD F**

**4:00 DOES IONIZING RADIATION EFFECT PLANT GROWTH? Alexander J. Seidensticker, 4 Shawnee Dr., Chillicothe, Ohio, 45601**

I observed the effects of ionizing radiation on Spinach *(Spinacea Oleracea)* and Tomato plants *(Lycopersicno Esculentum)*. Four groups for each plant were studied: Group One (Control Group) received no radiation; Group Two received 250 Rads of ionizing radiation; Group Three received 500 Rads of radiation; Group Four received 1000 Rads. Six seeds were used for each Tomato group and three seeds were used for each Spinach group. The seeds were radiated dry and grown hydroponically. For both Tomatoes and Spinach, I measured germination time period and percentage, stem length, leaf width, and leaf length. For the Tomatoes, Group Four had the best results, followed by Group Three, Group Two, and the Control. The Spinach had the best results in Group Two followed by the Control, Group Three, and Group Four. These results indicate that ionizing radiation aided growth in Tomatoes yet inhibited growth in Spinach. In certain types of plants radiation may be a possibility for food manufacturers to consider in order to produce larger crop yields.

**BOARD G**

**4:00 HUMAN ACQUISITION OF ANIMAL STAPHYLOCOCCAL SPECIES FROM CONTACT WITH HOUSEHOLD PETS. J.A. Taylor* and L.W. Ayers, Columbus School for Girls and Division Clinical Microbiology, The Ohio State University Hospitals, Columbus, OH 43210.**

Between 1975 and 1985 there was a remarkable rise in coagulase negative staphylococci isolations from wound and blood cultures in patients admitted to hospitals in the United States. These were commonly associated with artificial implants or deep vascular lines. Most isolates are the common skin saprophyte *Staphylococcus epidermidis* but about 15% are other species including those found on other warm blooded animals. The method of human acquisition of these animal species has not been documented. A household including three members and two pets were cultured for scalp carriage of staphylococci using common laboratory methods. Staphylococcal isolates were identified by a 24 biochemical profile and the Microbial Identification System (MIS by Microbial ID, Inc., Newark, DE) a software package for computer monitored gas chromatography (Hewlett-Packard) . Each of the three family members had a different pattern of staphylococcal colonization. One had the expected *S. capitis* subsp *capitis*, the second had no staphylococci and the third had a major population of an animal species *S. equorum* and a minor population of human species. The family cat had no staphylococci and the family rabbit had a major population of *S. cohnii* subsp *urealyticum* and a minor population of *S. equorum*. This study demonstrates that close contact with household pets may lead to colonization of humans with animal species of coagulase negative staphylococci.

**BOARD H**

**4:00 CHEMICAL CHAOS: COMPUTER MODELING OF THE BELOUSOV-ZHABOTINSKII REACTION VIA THE SEVEN VARIABLE RICHETTI PROPAGATOR. David S. Fieno, 5437 Wasigo Dr., Cinti., OH 45230.**

Deterministic chaos has been seen in the Belousov-Zhabotinskii (BZ ) by researchers all over the world . This research was intended to create a

mathematical model of the reaction so its behavior could be quantified and studied. The model was constructed from the original 22 step reaction mechanism published by Field, Noyes, and Koros (1972) and was abstracted down to nine steps using the Richetti scheme. These yielded seven nonlinear differential equations which were integrated using Gear's stiffly stable method. The main program was compiled in FORTRAN and ran on Sun 5 work stations. Many initial conditions were tested which allowed a large area of phase space to be explored and many phenomena to be observed. The model accurately produced many of the BZ's features including excitability, bistability, limit cycle shape, induction period length, and bifurcations to oxidized and reduced steady states. However, the model failed to produce the characteristic behavior of the reaction: chaos. In a similar study (Stern, 1989), it was suggested that the chaos seen so far in the BZ by other researchers is not real, and was created by errors of the experimenters themselves. To finish the assay, and to prove that this model is accurate, another model will be constructed that simulates not only the reaction, but also the effects of researcher's errors. If this model produces quasiperiodic behavior that is closely related to but not actually chaos, by implication, all physical examination of chaotic or turbulent systems is highly suspect.

## O. Engineering
## Only Morning
## 9:00 am, Saturday, May 2, 1992
## College of Business Administration 148
## Miles K. Free, Presiding

**9:00 ENGINEERING AND MANUFACTURING PRODUCTIVITY.** **F.J. Jankowski (Professor Emeritus Wright State University) 5800 Mahogany Place NE, Albuquerque, NM 87111**

Our engineering establishment can make a substantial impact toward restoring our position as a leading manufacturing nation. First, recognize that manufacturing jobs will decline from the present 17-20 percent to 3-5 percent of the work force, a parallel to the decline in agricultural employment. Next, we must instill in our graduates a motivation to make this happen, without losing recognition of the importance and impact of employment, profit motives, and the need to be productive and competitive; at the same time the graduate should not be distracted by situations such as allegations of discrimination and conspiracy by competing nations. Engineering graduates will need an enhanced emphasis on design and application of robots (a very high priority), on production processes and resources, on materials, and on manufacturing processes; they will need a continuing recognition of the importance of designing for production, designing user friendly products, and designing reliable products. Reversing our decline in manufacturing will occur slowly, intensifying as today's graduates move into middle management positions. This course can be enhanced by changes in policy, attitudes, and approaches in other fields, and by strong positive leadership at the highest levels in our nation.

**9:30 ESTIMATION OF PRODUCTION RATE IN DIE CASTING.** **Zeynel Arslanoglu, Robert B. Abella, James Daschbach, University of Toledo, Ind. Eng.Dpt. 2801 W.Bancroft,Toledo, OH, 43606**

The production rate of die casting greatly influences the casting cost. The rate depends on the design of the part in the die, the part weight and the geometric complexity of the part. It would be beneficial to estimate the production rate from simple measurable attributes of the part. This paper presents a mathematical model to estimate the maximum production rate for parts produced in 600 ton presses with 1 and 2 cavity dies. The model is a function of part weight, projected area, circumferential length of the part, and the number of cavities in the die. Based on 47 part data, the model explains 90% of the variation. The model can be used to control the cost at design stages as well as to estimate the casting cost of a new part.

**9:45 IMPROVEMENT OF DESIGN OF PARTS FOR WHICH DRAWING NO LONGER EXISTS.** **Mohammad M. Haq, Robert J. Abella, Roger J.McNichols. University of Toledo,Ind. Eng.,2801 W. Bancroft, Toledo, OH 43606**

This presentation focuses on the use of reverse engineering technique to improve the design of Vibratory bowl feeders. The Vibratory bowl feeders are used to separate and to orient parts for further processing for automated material handling applications. The bowls are produced from casting, which are then machined to provide the required surface finish. Initial development of the bowls consisted of manufacturing and testing prototypes. These prototypes were used as models to develop the casting molds. As a result engineering drawings were produced for the bowls. To obtain drawing production bowls were reversed engineered using a coordinate measuring machine and special software. The reverse engineering procedure yielded an exact copy of the part which revealed some striking deficiencies.These deficiencies were the result of problem in the initial design and deviation from the design which were deficiencies introduced by the capabilities of the manufacturing process.The presentation describes the reverse engineering process including digitizing, information transfer and data interpretation. Product design deficiencies are described and the methods developed to covert these deficiencies are discussed.

**10:00 HIGH LEVEL PETRI NET MODELS FOR AUTOMATED MANUFACTURING SYSTEMS.** **Faisal Fadul, Division of Science, Engineering, and Technology, The Pennsylvania State University at Erie, The Behrend College, Station Road, Erie, PA 16563-0203.**

Petri nets have evolved into a powerful tool for analyzing and modeling manufacturing systems. In this presentation the speaker will propose an approach, using high level Petri nets (Colored Petri nets) for modeling manufacturing systems. The proposed approach will be illustrated for a Flexible Manufacturing Cell (FMC). This approach facilitates the integration of the coordination subsystem with the local controllers and with the decision subsystems.

**10:15 MODERN POWER DISTRIBUTION CONTROL.** **Monir Ahmad, Dr. Eng., P.E.. The Pennsylvania State University at Erie, The Behrend College, Station Road, Erie, PA 16563-1200.**

In a power distribution system, circuit breakers are operated either by relays or by solid state controllers installed for each breaker. It would be more convenient to control the system if only one controller can operate several circuit breakers from a central location. Moreover, if the controller is developed using digital technology so that it can be programmed for different breaker settings and system requirements, flexibility and reliability will improve. A microprocessor based central controller was developed to replace relays for better reliability and flexibility. The controller monitors the currents of several breakers and compares them with reference values. In case the current in a breaker exceeds its reference value, a trip signal is generated and sent to its tripping device to open it. A software was developed to operate the microprocessor circuit and interface it with a personal computer where the operator can enter high level commands to operate the system.

**10:30 ACTIVE CONTROL FORCES FOR EARTHQUAKE PROTECTION OF STRUCTURES.** **Yi Wang & James B. Farison, Department of Electrical Engineering, and Naser Mostaghel, Department of Civil Engineering, The University of Toledo, Toledo, OH 43606.**

On-line generation of control forces to counteract the effects on building structures of ground motion during earthquakes is called active control, and is currently being studied as a supplement to passive earthquake mitigation methods such as energy absorbers. This paper reviews the work to date on active control, and describes some preliminary results of a feasibility project underway at UT. The approach is based on a two-stage isolation design, with the first stage being a passive system and a base from which a control force is generated for the second stage. The control force is activated by sensor measurements of earthquake motion and is designed to completely counteract the effects on the superstructure. By incorporating feedback from the actual building motion, residual errors are reduced to further stabilize the building. This paper describes the mathematical models of the building and of the control system strategy, and reports results of initial analysis and computer simulations for typical building parameters and earthquake motions.

**10:45 A SIMPLE GRAPHICAL PREDICTION METHOD FOR OPTIMUM BATTERY SELECTION.** **Jacqueline Ann Shuster, 3011 Blue Spruce Ct. Perry, OH 44081**

Two commercial battery chemistries, alkaline $MnO_2$ and zinc-air, were tested to determine their power vs. energy characteristics. Batteries were discharged at various rates (10-120 hours) to measure the amount of useful energy obtainable as a function of power level. Discharging for both chemistries at very high power levels (1 hr) was difficult because of

limitations in the experimental set up. For both chemistries examined, the power and energy were plotted on a single graph of power (y-axis) vs. energy (x-axis). Documented power and energy requirements for several important battery applications including electric cars, torpedo propulsion, heart pacemakers, and hearing aids were also plotted. This approach has provided a simple graphical method for directly comparing batteries and matching their performance to the applications mentioned. Experimental results verify that the tested $MnO_2$ batteries had nearly 40% higher specific energy than published values (340-370kJ/kg vs. 200-250kJ/kg). Over the range of power levels tested zinc-air data matched published power vs.energy values almost perfectly. Therefore, it has been found that the two chemistries are suitable for most consumer applications. However, they are not suitable for very high powered applications such as electrically propelled torpedoes, and electric automobiles.

## O. Engineering
## First Afternoon & Business Mtg.
## 1:30 pm, Saturday, May 2, 1992
## College of Business Administration 148
## Yung-Tse Hung, Presiding

**2:00 EFFECT OF ALTERNATE SUBSTRATE ON BIODEGRADATION. Majid Zarrinafsar*, Yung-Tse Hung*, Ruth Yu-Li Yeh*; *Civil Engineering Department, Cleveland State University, Cleveland, OH 44115 **Chemical Engineering Department, Ming Hsin Engineering College, Hsin Chu, Taiwan.**

The metabolic responses of microorganisms to a mixture of organic substrate are not well understood. A wide range of mechanisms including sequential utilization to concurrent utilization has been reported in the literature. o-, m-, and p-chlorobenzoates are degraded about 63-69 % in 28 days by bacteria in the activated sludge process without an increase in cell number. By providing glucose as an additional substrate, the rate of microbial decomposition of the chlorobenzoate was enhanced. The 2,4-D acclimated culture does not show any change in the rate of removal of 2,4-D, when glucose or lactose is introduced as an additional substrate. On the other hand, additional nutrients and organic substrate increase the rate of 2,4-D and 3,5-D utilization exposed to non-acclimated microorganisms. Competitive inhibition effect on the uptake of one substrate on the uptake of another in a system of multiple substrates are common and will be discussed.

**2:15 NOVEL IN VIVO ULTRASONIC NEAR WALL SHEAR RATE MEASURING DEVICE. R.S. Keynton and S.E. Rittgers, Department of Biomedical Engineering, The University of Akron, Akron, OH 44325.**

Hemodynamics, especially low wall shear stress, plays a key role in the development of atherosclerosis and bypass graft intimal hyperplasia. Wall shear stress has often been measured using a single-point velocity measurement, the wall no slip assumption and a linear regression. Since near wall shear stresses are more accurately measured with additional points, it is the purpose of this paper to introduce a new transducer using three velocity points to determine near wall shear stresses in vivo. Three 20 MHz ultrasound crystals (d=1 mm) were imbedded in an elastomer at distances of 1.5 mm and 2.1 mm with beam angles of 30°, 45° and 60° to the horizontal plane. Calibration was done under steady, fully developed flow conditions at Re = 250. Beam angles were within $3.6 \pm 2.5°$ (maximum = 8°) using velocity vs. range data fitted with a 2nd order regression compared to the expected parabolic relation. Near wall shear rates were $21.4 \pm 1.9\ s^{-1}$ compared to the theoretical value of $25.5\ s^{-1}$. Results from this study show this device to be a viable measure of near wall shear rates in vivo.

**2:30 FATE OF PCP IN THE ENVIRONMENT. Majid Zarrinafsar*, Yung-Tse Hung*, Ruth Yu-Li Yeh** ;Civil Engineering Department, Cleveland State University, Cleveland, OH 44115 **Chemical Engineering Department, Ming Hsin Engineering College, Hsin Chu, Taiwan**

This paper discusses the toxicity, usage, chemistry, and fate of PCP in the environment. Photolysis, sorption, and biodegradation of PCP appear to be important fate processes in aquatic environment. Photolytic degradation is limited to surface layer, while microbial metabolism assumes more importance in deep water. Sorption by the organic matter in sediments and soils plays a significant role in transport and storage. Hydrolysis, oxidation and volatilization do not appear to be significant factors for the fate of PCP in the environment.

**2:45 CHARACTERIZATION OF SUBBASE MATERIALS WHICH CAUSE TUFA DEPOSITION IN HIGHWAY SUBDRAINS AND CATCH BASINS: - [1]Gupta, J.,[2]Kneller, W.A., and [1]Tamirisa, R., University of Toledo, Toledo, OH 43606.**

Tufaceous material has been observed clogging many subdrains along highways in Northeastern Ohio. Tufa has been also found in catch basins and spill ways. Previous studies suggest that the free lime (CaO) present in subbase materials is responsible for the deposition of the tufa. X-ray, SEM and other physicochemical tests were employed on the air cooled blast furnace (ACBF), open hearth (OH), basic oxygen furnace (BOF), electric arc furnace slags and recycled portland cement concrete (RPCC). In addition, leachate and surface area measurements were performed on these samples. The latter showed that some samples were more reactive than others. X-ray analysis indicates the presence of portlandite ($Ca(OH)_2$) in many samples. Residual free lime is also present in some samples as determined by the 'sugar test'. Rain water entering the subbase, hydrates CaO forming $Ca(OH)_2$, which in turn raises the pH to 12 or more. The atmospheric $CO_2$ dissolves in the water forming carbonic acid ($H_2CO_3$) and conditions prevail in the subdrains which cause $Ca^{++}$ ions to combine with $CO_3$=ions to form $CaCO_3$. If the activity product of $Ca^{++}$ ions and $CO_3$=ions is less than $10^{-8.3}$ at 25°C,$CaCO_3$ will remain in the solution or otherwise will precipitate. The solubility of $CaCO_3$ decreases with increase in temperature which explains why it precipitates more during summer months. There is an immediate need to fix the free and slaked limes in the subbase materials to prevent the deposition of tufa. Research is in progress to chemically fix these limes, thus permitting the continued use of slags and RPCC. [1]Civil Engineering Department [2]Geology Department.

**3:00 ADSORPTION OF PHOSPHORUS IN THE RIVER NEAR WASTEWATER TREATMENT PLANT. Mohammad A. Sarker* Yung-Tse Hung*, Ruth Yu-Li Yeh** *Civil Engineering Department, Cleveland State University, Cleveland, OH 44115; **Chemical Engineering Department, Ming Hsin Engineering College, Hsin Chu, Taiwan.**

An intensive study of the water and sediments in the vicinity of a wastewater treatment plant was conducted in 1979-80 to characterize the major factors controlling the mobility of effluent derived phosphorus. The adsorption of phosphorus from solution is accomplished primarily through the action of suspended sediments and to a lesser degree by bottom sediments. A diurnal cycling of phosphorus was observed within the water column by phytoplankton, which was related to diurnal variations in dissolved oxygen, pH, and temperature observed in the tidal river. The cyclic uptake and release is superimposed on a relatively constant level of removal, which is attributed to inorganic adsorption mechanism. The level of P saturation decreased rapidly with distance from the outfall, sediments in the lower portions of embayment are close to values typical for tidal river sediments several miles downstream. Adsorption is ultimately limited by the stoichiometry of ferric phosphate minerals.

**3:15 WATER QUALITY OF NORTH CAROLINA STREAMS. Ashok G. Javalgi*, Yung-Tse Hung*, Ruth Yu-Li Yeh** *Civil Engineering Department, Cleveland State University, Cleveland, OH 44115, **Chemical Engineering Department, Ming Hsin Engineering College, Hsin Chu, Taiwan.**

The samples of river water collected from Cape Fear River basin by U. S. Geological Survey were analyzed for water quality data. The concentration of dissolved oxygen at Lock 1 fell slightly below 5.0 recommended for fish populations. PH from all stations were frequently below the lower limit of 6.5 standard. Sodium averaged 8.6 mg/l, while bicarbonate averaged 17.5 mg/l at Lock 1. At Lock 1 the available nitrogen averaged 1.21 mg/l and available phosphrus averaged 0.21 mg/l. The algal growths was not a problem in the river.

**3:30 ANALYSIS OF WATER QUALITY IN MAJOR U. S. RIVERS. Nataraj H. Parwar*, Yung-Tse Hung*, Ruth Yu-Li Yeh**, *Civil Engineering Department, Cleveland State University, Cleveland, OH 44115. **Chemical Engineering Department, Ming Hsin Engineering College, Hsin Chu, Taiwan.**

Water quality data from two nationwide sampling networks consisting of more than 300 locations on major U.S. rivers were analyzed to determine

long term water quality trends. Observed trends in 24 water quality measures for the period of 1974-81 showed both improvement and deterioration in stream quality during the time of major changes in atmospheric and terrestrial influences on surface waters. Results indicated widespread decrease in lead and fecal bacteria concentration, and widespread increase in nitrate, arsenic, and cadmium concentrations. Changes in municipal wastewater treatment, leaded-gasoline consumption, highway salt use, nitrogen-fertilizer application, and regionally variable trends in coal production and combustion during the period, appear to be reflected in water quality changes. Atmospheric deposition of a variety of substances has played an important role in water quality changes.

**3:45 HAZARDOUS WASTEWATER TREATMENT WITH ACTIVATED CARBON ADSORPTION. Pradip M. Patel*, Yung-Tse Hung*, Howard H. Lo**, *Civil Engineering Department, **Department of Geological Sciences, Cleveland State University, Cleveland, OH 44115**

A batch adsorption study was conducted for treatment of hazardous industrial wastewaters. Powdered activated carbon and granular activated carbon were used as adsorbent. The batch shaking experiment was conducted for a period of 24 hours. Shaking time includes 1, 2, 4, 6, 8, 12, and 24 hours. The feed wastewater TOC concentration varied from 225 to 1800 mg/l. The carbon dosages were from 0 to 12.5 g/l. Results indicated that TOC decreased with increase in carbon dosage and shaking time. Turbidity decreased with increase in carbon dosage as well as shaking time. The pH increased with increase in carbon dosage and shaking time.

**4:00 EFFECT OF SUBSTRATE ADDITION ON YEAST TREATMENT OF FOOD WASTEWATERS. Suresh Mullangi*, YungTse Hung*, Howard H. Lo**, *Civil Engineering Department, **Department of Geological Sciences, Cleveland State University, Cleveland, OH 44115**

An aerobic bench scale batch reactor study was conducted to determine the effect of sugar addition on the performance of yeast treatment of food wastewaters. Four types of food wastewaters studied include potato, milk, sugar and starch wastewaters. Parameters investigated include types of food wastewaters, types of yeasts, pH levels, and sugar dosages, and wastewater strength. Types of yeasts include beer and Baker yeast. PH levels consist of 4, 6, and 8. Feed strength includes 500, 1250, and 2000 mg/l TOC (total organic carbon). A total of 12 reactors was used in the study. Three reactors were control reactors without sugar addition. TOC, TSS (total suspended solids), VSS (volatile suspended solids), and pH were determined during the batch reactor study. The TOC removal efficiency varied from 68 to 81 %. An increase in TOC removal efficiency was observed with an increase in sugar dosage in the feed. About 3 to 5 % increase in TOC removal was observed with an increase in sugar dosage of 100 mg/l. Better TOC removal efficiency was obtained with beer yeast at a pH of 4.

**4:15 EFFECT OF CADMIUM AND COPPER ON TREATMENT OF FOOD WASTEWATERS USING BIOAUGMENTATION. Janardhanan Krishnan Prasad*, Yung-Tse Hung*, John M. Wong**, *Civil Engineering Department, Cleveland State University, Cleveland, OH 44115, **General Environmental Science Corp , Cleveland, OH 44122.**

A lab study was conducted to determine the toxicity effect of cadmium and copper on the batch activated sludge treatment of food wastewaters with bioaugmentation. Ten batch reactors were used in this study. Parameters investigated include type of LLMO (live liquid microorganisms), dosage of LLMO, dosages of heavy metals, and feed TOC. The heavy metal dosages include 10, 15, and 25 mg/l. One reactor was used as control reactor without heavy metal addition but with LLMO addition. The TOC removal efficiency obtained was about 90%. The reactors with the high dosage of heavy metal addition had the lowest TOC removal efficiency of 38%. The TOC removal efficiency for control reactor varied from 78 to 90%. The reactor with a high dosage of heavy metal addition had a TOC removal efficiency of 48, and 38 %, for cadmium and copper addition, respectively.

**4:30 EFFECT OF PHENOL TOXICITY ON TREATMENT OF FOOD WASTEWATERS USING BIOAUGMENTATION. Chandra S. Reddy Kallam*, Yung-Tse Hung*, John M. Wong**, *Civil Engineering Department, Cleveland State University, Cleveland, OH 44115, **General Environmental Science Corp. Cleveland, OH 44122.**

A laboratory study was conducted to determine the toxicity effect of phenol on the activated sludge treatment of food wastewaters using bioaugmentation. A total of 11 batch reactors were used in the study. Two control reactors were used. One was without bioaugmentation, while the other was without phenol addition. Parameters investigated include phenol dosages, LLMO (live liquid microorganisms) dosages, and feed TOC (total organic carbon) concentration. The maximum concentration of phenol used was 50 mg/l. It was found that at the maximum concentration of phenol there was still significant TOC removal although the TOC removal efficiency decreased compared to the reactor without phenol addition. The difference was about 25%. The TOC removal efficiency decreased as the phenol concentration increased from 10 to 50 mg/l. The TOC removal efficiency increased as the LLMO dosages increased from 10 to 200 mg/l.

**4:45 PHITOLYSIS OF HALOGENATED HYDROCARBONS. Majid Zarrinafsar*, Yung-Tse Hung*, Ruth Yu-Li Yeh**, *Civil Engineering Department, Cleveland State University, Cleveland, OH 44115, **Chemical Engineering Department, Ming Hsin Engineering College, Hsin Chu, Taiwan.**

This paper discusses photo-catalyzed degradation of chlorinated hydrocarbons in the presence of $TiO_2$ and UV light (wave length 300-400 nm). Two types of photo-catalyzed reactions are discussed. The direct one, in which the light with the wave length of greater than 290 nm, catalyzes the chemical reaction in the surface waters. The ozone in the stratosphere filters out light of shorter wavelength. The photochemical transformation occurs when the chemical absorbed light is transformed into an excited state and undergoes transformation reaction. The indirect photolysis takes place if other chemical substances in water absorb light to form free radicals or excited states that interact with the target chemical. Photolysis of chloroform in which the compound is mineralized completely to $CO_2$ and HCL is discussed. Two other model compounds, TCE and PCE, which have been identified as contaminants of drinking water are also susceptible to photochemical oxidation are also discussed in this paper.

## O. Engineering
## Second Afternoon
## 2:00 pm, Saturday, May 2, 1992
## College of Business Administration 146
## Tom Hartley, Presiding

**2:00 RELIABLE STATE-FEEDBACK CONTROL SYSTEMS. R. J. Veillette, University of Akron, Department of Electrical Engineering, Akron, OH 44325-3904**

A new methodology for the design of reliable control systems has been derived. For a linear, time-invariant, multi-input system of differential equations in state-variable form, the methodology provides a means of computing a constant state-feedback gain matrix for which the closed-loop system will tolerate the outage of certain control inputs. A control-input outage represents an actuator failure in the control system; such an outage is modeled by setting the specific input to zero. Surviving inputs are still determined by the given constant state-feedback gains. Specifically, the closed-loop system using the given state feedback has the following properties: First, it is stable in the nominal case where no outages occur. Second, it is still stable despite the outage of *any* control inputs within a predefined "susceptible subset" of inputs. Third, in the case where *all* the susceptible inputs experience an outage, the state-feedback gains for the surviving inputs are optimal with respect to a given quadratic cost function. When some or all of the susceptible inputs survive, the state feedback is non-optimal; however, the cost in this case is still smaller than the optimal cost obtained using the non-susceptible inputs alone.

**2:15 FUNCTIONAL OBSERVERS FOR SPATIALLY DISTRIBUTED SYSTEMS. Tom T. Hartley, Lei Xia, E.E. Dept., U. of Akron, Akron, OH, 44325-3904.**

As computers are becoming ever faster, the day will soon come when large and spatially accurate simulations of complex systems will be able to run in real-time. When this becomes possible, two questions arise, 1) can it act as an observer with the error converging to zero, based on several measurements from the real system; and 2) & what do you do with the all that information. The first question is addressed here. It is assumed that the spatially distributed system can be written as a Laplace transfer function $G(x,\zeta,s)$, with input space $\zeta$, and output space x. Assume a sensor is placed at a point of detectability, x=n, and that the observer gain is $K(\zeta,s)$, with $\zeta$ chosen for stabilizability. Then the following relationships hold; e(n,s)=y(n ,s)-y(n ,s);L

$e(x,s)=y(x,s)-y(x,s);$ $\quad y(x,s) = \int_0^L G(x,\zeta,s)\, U(\zeta,s)\, d\zeta;$

$$y(x,s) = \int_0^L G(x,\zeta,s)\, U(\zeta,s)\, d\zeta + \int_0^L K(\zeta,s)\, G(x,\zeta,s)\, e(n,s)\, d\zeta.$$

With $G(x,\zeta,s) \cong G(x,\zeta,s)$, the characteristic equation for the observer becomes, via $e(\eta,s)$; $\quad 1 + \int_0^L K(\zeta,s)\, G(\eta,s)\, d\zeta = 0$.

As long as the observer gain, which can now be dynamic, is chosen so that all the roots of this equation (usually infinite in number) are in the left half s-plane, then the error in the observed system will decay to zero.
*Funding:* This research was partially supported by The Advanced Control Tech. Branch of NASA Lewis Research Center via grant NAG 3-904.

**2:30 EFFICIENT COMPUTATION OF BALANCED REALIZATION THROUGH INPUT-OUTPUT NORMALIZED JORDAN FORM. Arvind Srinivasan, Department of Mechanical Engineering, University of Akron, OH 44325.**

Several techniques have been developed to obtain reduced order state space model to represent complex dynamic system. One of the efficient methods to reduce the system is through the representation of the original system dynamics in a balanced form. A realization is said to be balanced, when the controllability and observability grammians are equal and diagonal. Many of the popular model reduction techniques require the computation of balanced realization. Numerous algorithms have been developed to compute balanced realizations. Most of the schemes start with a minimal realization and find appropriate transformation matrix to obtain a balanced realization. However, there has been another instance where Jordan realization is used as the starting point. This method is very robust and reduced the number of computation by a considerable amount. In this paper, we propose a new scheme to compute a balanced realization which further reduces the computation burden. This algorithm requires the original system to be represented in input output normalized Jordan (IONJR) form. Inherent properties of IONJR allow us to calculate a balanced realization with the following advantages. 1. The grammian of the system can be obtained by solving only one Lyapunov equation. 2. Solution of Lyapunov equation in Jordan form takes much less computation time with computation itself being numerically robust. 3. Also only one Cholesky decomposition is needed. The complete derivation of the algorithm will be presented in detail. The paper will also discuss the advantages and quantify some of the computation savings. Also some basic theorems concerning IONJR will be discussed. Numerical illustration of the algorithm will be done through two examples.

**2:45 APPLICATION OF GREEN'S FUNCTIONS TO THE MODELING OF HIGH SPEED FLOW PROPULSION SYSTEMS. Athanasios D. Sarantopoulos, Department of Electrical Engineering, The University of Akron, Akron, OH 44325-3904.**

One of the most essential components of an internal propulsion system is the supersonic inlet. In the past many approaches have been followed in order to model supersonic inlets accurately. A new approach for modeling compressible flow inside a supersonic inlet using Green's functions is developed. An outline of the technique is to first position a normal shock near the throat of the inlet with an associated shock transfer function Z(s), while the downstream boundary is simply reflective. A downstream input $\underline{f}ds$ and an upstream input $\underline{f}us$ are also included in order to model combustor signals or perturbations in the free stream atmosphere. For maximum inlet efficiency, the position of the normal shock must be controlled accurately. This is accomplished by using a bypass door positioned alongside the duct, at a distance $x=\zeta$ from the throat of the inlet, in order to provide the appropriate flow signal $\Delta\underline{u}(s)$ for the controller. The objective of this method is to derive appropriate transfer functions for the system with the given initial and boundary conditions in order to determine its stability for various shock models assumed. The frequency response of the resulting system will be the superposition of the free response and the response due to the flow input at $x=\zeta$:

$$\underline{U}(s,x)=\underline{A}(s,x)F(\underline{f}ds,\underline{f}us)+\underline{G}(s,x;\zeta)\Delta\underline{u}(s).$$

The new technique is then applied to a 40-60 mixed compression inlet system where the theoretical results obtained using this method are found to match previously published experimental results.

**3:00 CHAOTIC MOTION IN RELAY CONTROL SYSTEMS, Faisal Fadul, Division of Science, Engineering and Technology, The Pennsylvania State University at Erie, The Behrend College, Station Road, Erie, PA 16563-0203.**

The occurrence of chaos, or chaotic motion, in the solutions of differential equations and feedback systems has aroused much interest in recent years. There are acceptable criteria for the existence of chaos in systems represented by nonlinear difference equations. However, no rigorous analysis exists for systems represented by nonlinear ordinary differential equations. In this paper, an analytical approach to test the existence of chaos in relay control systems represented by nonlinear ordinary differential equations of third order will be presented. This method is suitable for nonlinear feedback control systems characterized by dynamic hysteresis loops and dead zones.

**3:15 A FLOW MODELLING APPROACH TO REDUCED ORDER MODEL CHAOTIC SYSTEMS. Larry D. Murphy, Dept. of Electrical Engineering, University of Akron, Akron, OH 44325-0934**

It is the purpose of this presentation to demonstrate a method by which the order of a nonlinear chaotic system can be reduced by investigating flow directions. It is established by using the center manifold theorem that system states propagating in the direction of system flow can be removed from the system thus reducing the order of the model. This theorem however, requires that a zero eigenvalue be present in the system Jacobian and the full order system be reduced analytically. The method demonstrated in this presentation integrates the system Jacobian of the seventh order nonlinear system attributed to Franceschini in an attempt to determine which states most closely correspond to the flow direction. While the system Jacobian has no zero eigenvalues, it appears as though some of the states do closely propagate in the flow direction. The average value of these states over time is then used to reduce the model of the seventh order chaotic system (or fractal dimension between 3 and 4) to a fourth order chaotic system.

**3:30 THE SIMULATION AND MODEL REDUCTION OF GASDYNAMIC SYSTEMS. Shaun M. Immel, Dept. of Electrical Engineering, The University of Akron, Akron, OH, 44325-3904.**

In gasdynamic systems, information travels in one direction for supersonic flow and in both directions for subsonic flow. A shock occurs at the transition from supersonic to subsonic flow. Thus, to simulate these systems, any simulation method implemented must have the ability to capture the shock. In this paper, a technique combining both backward and central differencing is presented. This method is applied to the general quasi-one-dimensional nonlinear gasdynamic Euler's equations for density, momentum, and energy. The equations are subsequently linearized about an operating point and formulated into a large linear state space model. After proper implementation of the boundary conditions, the model order is reduced from 123 to less than 7 using the Schur method of balancing. Simulation results comparing frequency and step responses and pole locations of the reduced order models and the original system model are presented.

**3:45 TOMOGRAPHIC IMAGE RECONSTRUCTION FROM PROJECTIONS: COMPUTATIONAL ASPECTS OF SINGLE-PASS REALIZATIONS OF ITERATIVE METHODS. Moufid Elhazzouri & James P. Farison, Department of Electrical Engineering, The University of Toledo, Toledo, OH 43606**

Iterative backprojection is one of the current methods of image reconstruction from projections such as x-ray CT. While there are several variations of this method, each involves a very large number of simple iterative scalar calculations, performed on-line after the image data are obtained from the system. This paper concerns a new alternative, but equivalent, single-pass algorithm, for which most of the calculations are performed off-line before the imaging application. Only a simple single-pass calculation is performed on-line as the image data are received from the x-ray sensors. The challenge of this single-pass realization of the iterative methods is the off-line precalculation of one very large matrix, a very computer-intensive operation. For the reconstruction of an NxN image from M angular projections, the reconstruction matrix is $N^2$xMN (or a matrix of $MN^3$ elements). Computational requirements (matrix partitioning, memory requirements, CPU time) are described. A 132x132 image reconstruction on a CRAY YMP/8supercomputer using simulated projection data from an actual image illustrates the single-pass method.

**4:00 IMAGING ON HYPERCUBE. Dr. Devinder Kaur, Dept. of Electrical Engineering, The University of Toledo, Toledo, OH 43606-3390**

Hypercube is a versatile multiprocessor architecture, where each processor is placed at the node of a hypercube. A d-dimensional hypercube has $2^d$ processors. In a d-dimensional hypercube, each processor is directly connected to (d-1) other processors and any given processor can communicate with any other processor in the hypercube configuration in d hops. Each hop is defined as the path between two directly connected processors. Hypercube is a very flexible architecture in the sense that different topologies viz., ring, mesh and tree can be realized from a hypercube by traversing the nodes in a defined manner. These features have been utilized to map a 2D image on hypercube. The spatially decomposed image renders itself very suitable for parallel processing by different nodes of the hypercube. The internode communication is done with message passing techniques. The image mapping techniques on hypercube and some image processing algorithms have been discussed.

**4:15 ON THE PARTIAL BLOCK CODING OF PARALLEL TRANSION-TRELLIS CODED MODULATION. Junghwan Kim, The University of Toledo, Dept. of Electrical Engineering, 2801 W. Bancroft St., Toledo, OH 43606**

With the increasing demand for an efficient digital modulation technique both in power and bandwidth, Trellis Coded Modulation (TCM) has been widely investigated because of its increased gain without bandwidth expansion, especially for the strictly band-limited satellite communication. However, TCM with parallel transition paths, that is inevitable under coding rate n/(n+l) when $2^n$ exceeds the number of states, is fairly vulnerable to the fading effect. To cure this degradation, multiple TCM (MTCM) was proposed. However, it turned out to be effective under very limited condition of fading (severe fading) and system complexity gets increased as M gets larger. The method of combining block code with conventional TCM can avoid the anticipated system complexity of MTCM whereas the performance degradation can be compensated. By pre-coding the information bit(s) assigned to the parallel transition path(s) in conventional TCM encoding, with relative short-length block code such as BCH code or Hamming Code, the parallel transition can be avoided. To meet the unified coding rate, interleaver should be used before trellis encoding in this case. For the decoding, all the received bits are initially decoded by Viterbi decoder, then addition block decoding is followed. In this case, the average BER depends on the minimum weight of the block code.

**4:30 DESIGN OF A MOSIS FABRICATED FULL SWING BiCMOS TRI-STATE I/O PAD TO DRIVE A 50pF CAPACITIVE LOAD. Conrad Menezes and Edwyn Smith, Department of Electrical Eng., The University of Toledo, Toledo, OH 43606**

In recent papers there has been a great deal of interest in the implementation of BiCMOS technology and justifiably so, considering its merits such as high speed, lowcost and analog compatibility. Fabrication of high performance (Hi-BiCMOS), lowcost circuits with ≤0.8μm design rules, using advanced process technology is still the dominion of industry. At the university level access to the manufacture of low-cost BiCMOS circuits is restricted solely to that being provided through MOSIS, besides inhouse fab facilities. The absence of a buried layer in the MOSIS 2μm, n-well, low-noise, analog process coupled with a lack of characterization data for bipolar transistors further heightens the problem of implementing an analog IC design. A need for the proposed design originated from the fact that the MOSIS supplied tristate I/O pad is far too slow when driving a capacitance of a relatively large magnitude. Efforts to characterize the bipolar (NPN, PNP) were undertaken in the form of a test chip fabricated through MOSIS which included several bipolar transistors and base diffused resistors. The data obtained was used in SPICE simulations for studying the response of a number of BiCMOS buffers. Bipolar speed can be increased by reducing the voltage swing, but this makes bipolar circuits less effective when switching CMOS logic. On the other hand circuits with full swing have a better noise margin and interface well with classical CMOS circuits. Full swing for the proposed design is achieved using a shunt network (MOSFET) between the collector and emitter of the bipolar. Results of SPICE simulations as compared to those supplied by MOSIS for driving a 50pF load show a 20.9706ns decrease in the rise time, and a 17.6116ns decrease in fall time. Propagation delays obtained were of the order of 5.2178ns for $P_d$(0-1) and 5.2582ns for $P_d$(1-0). Simulation values of propagation delay time for the MOSIS tri-state I/O pad are not supplied by MOSIS.

**4:45 OPTIMAL GENERATION SCHEDULING IN A POWER SYSTEM. Monir Ahmad, Dr. Eng., P.E., The Pennsylvania State University at Erie, The Behrend College, Station Road, Erie, PA 16563-1200.**

Optimal scheduling of generator outputs to meet power system demands, called the economic dispatch, is a nonlinear problem in which the objective is to minimize generation cost and the constraints are the load flow equations and limits of generator output powers. Power flow limits of the transmission equipment can be added for system security. The overall problem becomes very large including many variables and constraints for a large power system. This requires a lot of computer memory space and computational time for its solution. To overcome these difficulties the overall economic dispatch problem was decomposed into two subproblems namely the real power dispatch and reactive power dispatch subproblems. The sequential solution of the two subproblems was made to converge to the solution of the overall problem by introducing a power balance constraint in the reactive power dispatch subproblem. The decomposition cut down the computer memory requirement considerably and also the computational time. Some other techniques were also used to further cut down the computational time. The approach was tested on the IEEE 30-bus system. The results were very encouraging.

## O. Engineering
## Poster Session
## Saturday, May 2, 1 992
## College of Business Administration Concourse

**BOARD H**

**10:00 PILOT ACCOMMODATION FOR THE ADVANCED TACTICAL FIGHTER: HUMAN VARIATION IN LIMB AND TRUNK PROPORTIONS. Hudson, J., Meindl, R., School of Biomedical Sciences, Kent State University, Kent, OH 44240; Zehner, G., Human Ergonomics Group, Wright-Patterson Air Force Base.**

The advanced tactical fighter that will serve the United States Air Force into the next century demands an adjustable cockpit design to accommodate a wide range of morphometric variation. Traditional statistical models using univariate percentile rankings fail to take into account the intercorrelations of body measurements. Thus, there is a need for an efficient statistical approach to model anthropometric variation. Principal components analysis (PCA) describes most variation in terms of a reduced number of axes: (1) overall body size, and (2) trunk length relative to limbs. In our sample of over 2000 flying personnel these principal axes differed significantly by sex and race. Boundary "shells" for various exact percentages of accommodation (e.g., 99%, 90%) were defined. Multivariate observations within such shells were accommodated, while those outside were not. Values of anthropometrics at boundaries were derived as equidistant points on the surface of the accommodation shells. Support was provided by System Research Labs (Grant #SRL-440677) and by Kent State University.

**BOARD I**

**10:00 SYSTEMS ANALYSIS OF RETINA BY WHITE NOISE MODULATED LIGHT STIMULUS FROM A VIDEO DISPLAY Greene, H. L. and Jagadeesh, J. M., Biomedical Engineering Center, The Ohio State University, Columbus, OH 43210**

In the vertebrate retina, rod and cone photoreceptors transduce incident light into graded electrical signals and make chemical synapses with horizontal cells in the outer plexiform layer. The lateral spread of these signals, as well as production of center-surround antagonistic areas, are known to take place at this level. We are characterizing the non-linear signal transformation that takes place from light input to horizontal cell output by computing its Wiener kernels. The necessary stimulus is achieved by applying to the retina spatially complex light patterns with components that modulate temporally in intensity at known rates with known amplitude distributions. We have developed a system to compute the kernels by adapting a custom designed pattern generator system (PGS). The PGS utilizes a computer-controlled graphical display and is used as a stimulus in physiological testing of the in vitro *Ambystoma Tigrinum* retina. It is programmed to flash patterns at specified intervals or move them in the plane of the retina at a specified rate. The PGS has been altered to deliver spatially distinct patterns which independently and simultaneously modulate in intensity according to memory-resident Gaussian white noise sequences.

The intensity modulation feature is particularly useful in experiments designed to elucidate the signal transformation, and more generally the image processing, that take place at various stages in the retina. Data from intracellular recordings are automatically sampled and stored for later cross-correlation analysis with the stimulus signal.

## R. Ecology
## Only Morning
## 9:00 am, Saturday, May 2, 1992
## College of Business Administration 132
## David Francko, Presiding

**9:00 AUTUMN LEAF-FALL AS A SOURCE OF TRIHALOMETHANE PRECURSORS . A.B. Martin and R.E. Carlson, Department Biological Sciences, Kent State University, Kent OH 44242.**

Trihalomethanes (THMs) form when chlorine reacts with certain naturally occurring organic molecules (THM precursors) during the disinfection of drinking water. THMs are believed to have significant carcinogenic and mutagenic properties. The elucidation of precursor sources is important because source management may lower costs and increase effectiveness of in-plant treatments. This study investigated the importance of organic compounds released from autumn-shed leaves during their decomposition in lakes as THM precursors. Leaf-packs consisting of two different leaf types, a rapidly decomposing species and a more recalcitrant species, were placed in a small, shallow lake on November 1, 1990. Leaf-packs were periodically collected between November and August and returned to the lab where THM precursor release rates were determined. Sephadex gel chromatography and synchronous fluorescence scans were used to characterize the organic material released during the decomposition of these two leaf types.

**9:15 AQUATIC MACROPHYTE LEAF-DISKS/ SHOOT SECTIONS AS CONTAMINANT BIOASSAY SYSTEMS. D.A. Francko, Dept. of Botany, Miami University, Oxford, OH 45056**

The development of aquatic macrophyte systems for toxicological modeling and assessment has remained an important but unresolved problem. Our laboratory group has developed short-term photosynthetic (14C)-carbon assimilation (PCA) bioassay protocols for leaf disk sections from the pondweed *Potamogeton amplifolius* and shoot sections from cultured seedlings of the water lily *Nelumbo lutea*. In *Nelumbo*, a shoot elongation rate bioassay was also developed. *Potamogeton* leaf disk data suggested that additions of hexavalent chromium and copper (0.5 ug to 10 mg/l) to lakewater incubation media produced ecologically significant changes in PCA rates (15 min - 4 h bioassays). However, the effects were not dose-specific and EC-50 values were difficult to compute. In *Nelumbo* shoot section bioassays (4 - 96 h), chromium at levels as low as 0.5 mg/l induced a strong stimulation of PCA. Shoot elongation rates in *Nelumbo* were strongly and dose-specifically repressed (EC-50 ca. 5 mg/l) by exposure to chromium (48 and 96 h bioassays). Taken together, the data suggest that the above short-term macrophyte bioassay systems hold promise as model ecophysiological and contaminant modeling systems.

**9:30 THE EFFECTIVENESS OF ROOT-CROWN REMOVAL HARVESTING IN CONTROLLING MACROPHYTE BIOMASS IN A NORTHEASTERN OHIO LAKE. James B. Hyde[1] and G. Dennis Cooke[2]. [1]110 Beacon Hill Dr., Penfield, NY 14526, [2]Department of Biological Sciences, Kent State University, Kent, OH 44242.**

Aquatic macrophytes often regrow rapidly following harvesting when root systems are left intact. A harvesting study was conducted on East Twin Lake (Portage county, northeastern Ohio) during the summer of 1989 to test the effectiveness of root-crown removal in delaying regrowth. Median dry weight macrophyte biomass between an unharvested control plot and two treated plots was compared following late-June/early-July harvesting. Root-crowns were removed by lowering the harvester's cutter bar 1-2 cm into the sediments. There was no regrowth in one treated plot, initially dominated by *Potamogeton pectinatus*, through the end of September. In the other treated plot, regrowth of *Myriophyllum spicatum* caused increased biomass after 41 days. This regrowth may have been facilitated by plant fragments which entered the plot from the untreated surrounding areas. In contrast to harvesting by stem cutting, a single root-crown removal harvest gave summer-long biomass control, though a second treatment, may be necessary in lakes infested by *M. spicatum*.

**9:45 POPULATION GENETICS AND CONSERVATION STATUS OF *VALLISNERIA AMERICANA* IN OHIO. Roger Laushman and Denise D'Abundo, Biology Department, Oberlin College, Oberlin, OH 44074.**

*Vallisneria americana* (American wild-celery) is currently listed as potentially threatened by the Ohio Department of Natural Resources, Division of Natural Areas and Preserves. Although *V. americana* was once abundant in Ohio, the ODNR database contained 55 sites for *V. americana* in 1990. Our 1991 survey revealed that only 33 of these sites are extant and only 22 are viable populations. Nine of the 22 populations are clustered around the islands of western Lake Erie. Nearly all remaining sites are in lakes or streams of northeast Ohio. Allozyme variation assayed by starch gel electrophoresis reveals relatively high amounts of variation for the species (a mean of 50% of loci are polymorphic). However, populations are genetically very isolated from each other ($F_{ST}$ = 0.457). Water mediated pollination and seed dispersal, plus habitat loss, limit gene flow in *V. americana*. Relatively large populations of the Lake Erie islands harbor the most genetic variation and may be most useful for conservation efforts. Populations of rivers and small lakes are the most isolated and therefore are more at risk ecologically and genetically.

**10:00 LIMNOLOGY OF OXBOW LAKE AND SURROUNDING WETLAND IN TRISTATE AREA. Gea-Jae Joo, Wendy D. Ransom and David A. Francko. Dept. of Botany, Miami University, Oxford, OH 45056.**

Oxbow lakes (formed by river cut-off) are a common and often highly productive floodplain feature of major rivers around the world. The Great Miami River, which has its source in mid-Ohio, has substantial wetland development before its union with the Ohio River. Due to the annual flooding event many water bodies undergo substantial limnological changes. We were interested in characterizing the limnology of a naturally originated oxbow lake and several artificially created gravel pits. From early spring flooding until the separation of the water bodies in early May the entire floodplain was covered in water. Water level fluctuations in all water bodies were approximately three meters annually. During the growing season, Oxbow remained fairly shallow (<1 m) while the gravel pits were relatively deep (3-9 m) and stratified during the summer. Dissolved oxygen level at Oxbow was consistently lower (4-7 mg/l) than other water bodies (9-12 mg/l) while all water bodies were turbid (Oxbow: Secchi depth 7cm, others: 50cm). Primary productivity at Oxbow was about 2 times higher than other water bodies (Oxbow:1010±760 mgC/$m^3$/h, North Pond:580±470, n=9 for both sites at the surface). The algal biomass in Oxbow lake remained approximately ten times higher than other water bodies (Oxbow: 110±88 Chl a ug/l North Pond: 13 ± 12, n= 13 for both sites). Study sites in the area other than Oxbow were found to be limnologically similar with the exception of lake stratification pattern.

**10:15 THE IMPORTANCE OF BACTERIOPLANKTON AND GRAZERS IN THE PHOSPHORUS DYNAMICS OF SANDUSKY BAY. Ralph J. Garono and Robert T. Heath, Dept. Biol. Sci.. Kent State University, Kent, OH 44242.**

This study investigated the following hypotheses: (1) that bacteria were superior competitors to algae for phosphate; (2) that algae dominate DOP uptake; and, (3) that grazing is important in the release of DOP. This study was conducted during the summer of 1991 along a phosphorus continuum in Sandusky Bay. Four sites (river, upper bay, lower bay and Lake Erie) were studied along a 40 km transect made from the Sandusky River into Lake Erie at monthly intervals. Samples were returned to the lab where they were serially filtered into whole, <20, <5, and <1 μm size fractions. Using radiometric procedures, uptake rates of phosphate and glucose-6-phosphate (G-6-P, a model DOP) were measured, as was the DOP release rate. We found that along the transect bacteria had higher rates of phosphate uptake than algae. Bacterial net uptake rates increased as larger particles were removed from the samples suggesting release from competition. Only algae took up G-6-P. The rate of DOP release was greatest in the <5 μm size class, suggesting that DOP release from bacteria depended on small bactivorous grazers.
This study was supported by Ohio Sea Grant.

**10:30 EFFECTIVENESS OF PHOSPHORUS INACTIVATION IN SHALLOW AND DEEP LAKES. G. Dennis Cooke[1], Eugene B. Welch[2], Donald G. Fulmer[1], James B. Hyde[1], and Angela B. Martin[1], [1]Department of Biological Sciences, Kent State University, Kent, OH 44242. [2]Department of Civil Engineering, University of Washington, Seattle, WA 98195**

Phosphorus (P) content of many shallow and deep lakes is influenced by sediment P release, which may delay lake recovery following an expensive nutrient diversion. P inactivation with aluminum salts is being used with increasing frequency in the U.S. to inhibit sediment P release, with the assumption that lake improvement will be accelerated. Effectiveness of P inactivation is evaluated not only by whether it inhibits P release but by whether such inhibition significantly reduces photic zone P and algal biomass. Studies with holomictic Washington lakes demonstrate effectiveness up to 10 years. Studies of dimictic Wisconsin and Ohio lakes suggest that vertical transport of sediment-released P was unlikely as a significant epilimnetic P source in some of them. P inactivation, while successful in providing up to 15 years of control of P release, may not always be a major factor in lowering summer algal biomass. Data for estimating success of P inactivation prior to application include a P budget and morphometric features.

## R. Ecology
## First Afternoon & Business Mtg.
## 1:30 pm, Saturday, May 2, 1992
## College of Business Administration 132
## Karl Havens, Presiding

**2:00 A COMPARISON OF GENETIC VARIABILITY IN FISH POPULATIONS IN A CLEAN WATER STREAM VERSUS THAT IN AN ADJACENT POLLUTED STREAM. Chris Lorentz, Nick Asbaugh, and Dr. L.P. Orr, Dept. of Biology, Kent State Univ. Kent, OH 44242**

Starch-gel electrophoresis was used to resolve 15 genetic loci to determine the impact of heavy metal pollution on the genetic variability of three fish species : *Catostomus commersoni, Pimephales notatus,* and *Semotilus atromaculatus.* Evidence for selection for pollution-tolerant genotypes was examined. The number and type of fish collected were also recorded to determine the impact on species diversity levels. Results from this study in the vicinity of Mansfield, OH, reveal a pattern of reduced genetic variability of the fish under severe pollution stress. A trend of increasing downstream heterozygosities was consistent among all three species. Species diversity levels were significantly lower at two sites on the polluted stream but levels at a third site downstream from the source of pollution approached those from the adjacent clean stream. On the basis of population size, these species appear to be tolerating the heavy metals; however, their reduced genetic variability make them extremely susceptible to future environmental changes.

**2:15 ZOOPLANKTON COMMUNITY STRUCTURE IN SANDUSKY BAY AND LAKE ERIE. S.J. Hwang and R.T. Heath, Dept . Biological Sciences. Kent State Univ. Kent, OH 44242-0001.**

The purpose of this study was to determine whether zooplankton community structures differed along a 40 km transect through Sandusky Bay (SB) to the international boundary in Lake Erie (LE). Sampled at monthly intervals from May through September 1991 at 9 stations rotifer, cladoceran and copepod abundance and distribution were examined. Using community indices (e.g. Shannon's diversity index and similarity index) and detrended correspondence analysis we found that the zooplankton community of SB differed from that of LE. Based on species composition, we conclude that community differences were due only to differences in rotifer composition; cladoceran and copepod populations did not differ significantly along the transect examined. Based on these findings, we believe that greater attention needs to be given to rotifer guild structure and function.This study was supported by Ohio Sea Grant.

**2:30 ACIDIFICATION EFFECTS ON THE PRODUCER-HERBIVORE INTERFACE IN A FRESHWATER PLANKTON COMMUNITY. Karl E. Havens, Dept. of Biol. Sciences, Kent State Univ., Kent OH 44242.**

An in situ experiment was done at East Twin Lake Ohio, to assess acidification effects on the ecological efficiency (Slobodkin 1960) of the grazing food chain in the plankton. Triplicate mesocosms were untreated (pH 8.5) or acidified to pH 6.5, 5.5 or 4.5 with $H_2SO_4$ over 9 days. Algal C assimilation declined with pH, and large cells became dominant. Zooplankton biomass and C assimilation also declined, as crustacean herbivores became extinct. In the low pH treatments, rotifers and nauplii were the only herbivores. Overall, there were reductions in ecological efficiency (zooplankton/algal C assimilation) and the ratio of zooplankton/algal biomass with declining pH. This reflected the development of a "bottleneck" to C flow at the producer-herbivore interface, where small zooplankton and large algae simultaneously became dominant.

**2:45 MACRO- AND MICRO-ZOOPLANKTON EFFECTS ON THE ALGAL COMMUNITY OF A EUTROPHIC OHIO LAKE. Karl E. Havens, Dept. of Biol. Sciences, Kent State Univ., Kent OH 44242.**

In situ experiments were done at Stewart Lake in Portage Co., to quantify macro- and micro-zooplankton effects on the algal community. Triplicate mesocosms were filled with (a) unfiltered lakewater, (b) 200 μm-filtered water, or (c) 80 μm-filtered water, and incubated for 3 dys. In the 200 μm treatment, crustaceans were reduced; rotifers, ciliates, algal biomass and growth rates of the dominant algal taxa increased. In the 80 μm treatment, all zooplankton were reduced, and algal biomass and taxa growth rates were lower than in the 200 μm treatment. Identical results occurred in a second experiment. The results show that macro- and micro-zooplankton can have opposite effects on the algae. In this case, the former suppressed growth while the latter enhanced it. The results also showed that macro-zooplankton can indirectly suppress the algae, by reducing the densities of beneficial micro-zooplankton.

**3:00 MEASUREMENT OF PLANKTONIC MEMBRANE POTENTIALS IN NATURAL AQUATIC COMMUNITIES. W.D. Ransom and D.A. Francko, Dept. of Botany, Miami University, Oxford, OH 45056**

Radiolabelled cationic partitioning probes have been used to estimate transmembrane electrical potentials in cultured algae, where the transmembrane electrogenic potential has been shown to provide the motive force for active transport of nutrients and ions. Similar processes have not been investigated in multi-specific natural planktonic systems. We examined size-fractionated planktonic assemblages from small SW Ohio lakes, using (3H)-tetraphenylphosphonium bromide (TPP+) as a transmembrane partitioning probe. Results from determinations of TPP+ uptake curves and partitioning dynamics, and non-specific retention of TPP+ by Nuclepore filters and killed cell controls suggest that this probe can be reliably used to estimate mean electrogenic potentials (ca. -110 to -140 mV) between particle interiors and the surrounding lake water. Our data support the view that such measurements may be valuable in examining the ecophysiology of community-level nutrient dynamics and metabolic control mechanisms within natural planktonic assemblages.

**3:15 *TRACHELOMONAS* EHRENB. FROM OXBOW LAKES AND A FARM POND: ELEMENTAL COMPOSITION OF ENVELOPES, TAXONOMY, AND POTENTIAL ECOLOGICAL IMPLICATION Gea-Jae Joo and David A. Francko. Dept. of Botany, Miami University, Oxford, OH 45046 and Visitación Conforti, Depto. de Biología, Ciudad Univ., Buenos Aires, Argentina.**

*Trachelomonas* Ehrenb. is a large euglenoid genus ( > 200 species). These are free swimming flagellates with distinctive envelope structures. Despite the high abundance in the diverse habitats, no major taxonomic and/or ecological investigation has been done in North America. Using scanning electron microscopy (SEM), X-ray analysis, and water chemistry of habitats, taxonomy and ecology of this group was investigated. Through the SEM study, we found over 50 taxa from 4 oxbow lakes (3 Alabama, 1 Indiana) and 15 taxa from a small farm pond in Ohio. Trachelomonas are very common during the late fall and winter. In an extreme case, over 90 percent of algae from a farm pond water sample collected in December consisted of 13 taxa of this group. X-ray microanalysis revealed that envelopes of these organisms consisted mainly of iron, manganese and silica (atomic % weight ratio of FE:MN:SI, 3 Alabama oxbows; 70:16:7 (n=42), Indiana oxbow; 23:5:50 (n= 17)). We believe our finding is an important step to understanding the ecological role of this group and warrant further investigation of this group in diverse habitats (especially wetland and seasonally separated water bodies along the large rivers, swamps and small ponds).

**3:30 EFFECT OF ZEBRA MUSSELS ON PHOSPHATE UPTAKE BY PLANKTON: A MESOCOSM EXPERIMENT. R.T. Heath and T.F. Nalepa, Dept. Biol. Sci., Kent State Univ., Kent, OH 44242-0001; and Great Lakes Environ. Res. Lab., 2205 Commonwealth Blvd., Ann Arbor, MI 48105-1593.**

Four 2000 L mesocosm enclosures were placed in Saginaw Bay near East Tawas, MI., enclosing natural plankton assemblages. Freshly collected zebra mussels *(Dreisenna polymorpha)* were added in low density (approx. 2000), or high density (approx. 12,000) to two enclosures: two enclosures were held as controls. After 6 days dissolved P concentrations were the same in

all enclosures. Phosphate uptake rate by plankton, determined radiometrically in samples returned to the lab, was slowed from 3.25 nmol/L/min in control communities to less than 0.05 nmol/L/min in those to which mussels were added. Phosphate uptake by both bacteria and algae was affected. Algae were heavily grazed by mussels, but bacterial numbers remained unchanged in all enclosures. We hypothesize that bacterial uptake was greatly slowed because of decreased amounts of DOC upon which bacterial growth depended. This study was supported by NOAA.

**3:45 BIOCHEMICAL EFFECTS OF ENDOD ON ZEBRA MUSSELS. Usha Nagavarapu. Department of Biology. University of Toledo. Toledo-43606.**

*Dreissena polymorpha* is a bivalve mollusk with dark and light striped shell from which it derives its common name, zebra mussel. Since its introduction ca. 1986 into the Great Lakes, they reproduce prolifically and threaten municipal water works by reduction or stoppage of water flows. Mechanical controls are labor intensive while chemical methods are not environmentally desirable. An alternative approach is to use natural biodegradable molluscicides. Lemmatoxins, molluscicidal saponins in *Phytolacca dodecandra,* (or Endod) are toxic to zebra mussels at concentrations of 10 to 20 mg/L in 24 hours. To determine the biochemical effect of Endod, mussels were incubated for 4, 8, 16, 24, 36, or 48 hours in the presence of 10, 20, and 40 mg/L. After that, gills were dissected and homogenized. Soluble protein in the crude gill extracts were quantified and analyzed by SDS polyacrylamide gel electrophoresis. Results show marked changes in 14 kDa to 21 kDa after 4 to 8 hours of exposure, and in 21 kDa to 42 kDa and 116 kDa to 200 kDa after 16 to 48 hours of incubation. Alterations seem to be influenced by the Endod concentration and duration of exposure. At the structural level Endod affects the integrity of the gill tissue, resulting in loss of ciliary beating which might impede respiration. Similar work with the byssal gland is in progress.

**4:00 DIATOM STUDIES OF HEADWATER TRIBUTARIES OF THE LITTLE MUSKINGUM RIVER, MONROE COUNTY, OHIO. Paul F. Wetzel and John H. Olive, Dept. of Biology, The University of Akron, Akron, OH 44325.**

Epilithic diatoms from headwater tributaries of the Little Muskingum River were studied to determine if brines from exempt Mississippian wells affected diatom community composition. Disturbed tributaries suspected of low-level brine pollution were dominated by species of *Navicula* spp. such as *N. viridula, N. cryptocephala* var. *cryptocephala, N. cryptocephala* var. *veneta,* and *N. cryptocephala* var. *exilis.* Relatively undisturbed tributaries were dominated by species of *Achnanthes* spp. such as *A. linearis* var. *linearis, A. linearis* var. *curta* and *A. linearis* var. *pusilla.* Other human activities exist as potential sources of pollution including oil exploration, farming, livestock grazing, logging, and small-scale construction.

**4:15 EFFECTS OF DIET AND WATER QUALITY ON SEVEN-DAY *Ceriodaphnia dubia* TOXICITY TESTS. Blas Cerda and John Olive. Department of Biology, The University of Akron, Akron, Ohio, 44325-3908.**

This study evaluated the effects of two waters and four diets on the results of seven-day *Ceriodaphnia dubia* toxicity tests. Survival and reproduction were used as indices to detect the sensitivity of *C. dubia* to acute and chronic copper stress. Organisms maintained in moderately hard reconstituted (MHR) water were less sensitive to acute and chronic copper stress than animals maintained in diluted well water. Diet also differentially affected the acute and chronic toxicity of copper. Daphnids fed *Selenastrum capricornutum* (alga) showed the highest sensitivity, followed by those fed the alga *Chlamydomonas reinhardti,* then by those fed a yeast-Cerophyll-trout food (YCTF) mixture plus *Selenastrum,* and finally by animals fed YCTF alone which were the least sensitive. These differences may be due to the poor nutritional adequacy of *Selenastrum* when fed alone, increased toxicant uptake by the daphnids through ingestion of copper-laden algal cells, sequestered copper ions by fats and insoluble substances in the YCTF food, and the reduced complexing of copper in the well water caused by the higher concentration of calcium and organic ligands. We regard YCTF plus *Selenastrum* and MHR water as adequate choices for testing this species.

**4:30 EXAMINATION OF THE HYPOTHESIS THAT GRAZING BY *DAPHNIA* CONTROLS ALGAL BIOMASS IN A SMALL N.E. OHIO EUTROPHIC LAKE. Andrew J. Rodusky and Karl E. Havens, Dept. of Biol. Sciences, Kent State Univ., Kent, OH 44242.**

We examined the hypothesis that grazing by *Daphnia* controls algal biomass in Stewart Lake, a small glacially-formed kettle lake in Portage Co. To quantify zooplankton-algal-nutrient relationships, seasonal changes in zooplankton densities and species composition, chlorophyll (CHL) , total phosphorus (TP), and Carlson's Trophic State Indices (TSI) were recorded. TP ranged from 30-50 ug/l, and the mean TP TSI was 60. CHL ranged from 1-11 ug/l, and the mean CHL TSI was 50. Both TSI's classified Stewart Lake as eutrophic. *Daphnia* densities were very high. TSI TP was>TSI CHL, suggesting that the algae were limited by some factor other than phosphorus, perhaps grazing by the *Daphnia.* However, we found no relationship between (TSI TP - TSI CHL) and *Daphnia* densities. If *Daphnia* grazing was limiting algal biomass, a positive relationship would be expected. Also, there was no relationship between the portion of chlorophyll in different size fractions and *Daphnia* density. Overall, the data did not support the hypothesis.

## R. Ecology
## Second Afternoon
## 2:00 pm, Saturday, May 2, 1992
## College of Business Administration 133
## James R. Runkle, Presiding

**2:00 LONGER-TERM FAUNAL CYCLES IN THE CENTRAL CANADIAN ARCTIC, John F. Wing and Donald J. Glazier, Wittenberg University, P.O. Box 720, Springfield, OH 45501.**

Are ~10-yr and ~20-yr cycles restricted to the boreal? To test for this, the available fur and catch records from the tundra or polar regions were detrended and subjected to contingency periodogram (Legendre et al, 1981) and cross correlation analyses. Jones' (1912) fur record for the muskox *(Ovibos moschatus)* over the 44-yrs, 1868-1911 showed significant ($p<.01$) 11-yr and 22-yr cycles. Bockstoce's (1980) population estimates for the Porcupine herd of the barren-ground caribou *(Rangifer tarandus)* for the 18 yrs, 1890-1907, showed a significant 9-yr cycle ($p<.05$) or longer. These two prey species' records correlated $r=.56$ ($p<.02$) at a 2-yr lag. When compared with the only available wolf series, an all-Canada wolf-coyote (*Canis* sp.) fur record of Jones (1912), significant ($p<.05$) predator-prey correlations were found. The wolf record also showed significant ($p<.05$) 10-yr and 20-yr cycles. Finally, the records of these two terrestrial grazing mammals even cross-correlated significantly with the catch records for a marine grazing mammal, the Bowhead whale *(Balaena mysticetus)* from the Beaufort Sea and Hudson Bay (Ross, 1979): the caribou correlated $r=.66$ ($n=18$, $p<.01$) at 0-lag and the muskox correlated $r=.67$ ($n=20$, $p<.01$) at a 3-yr lag. Bowhead catch in the Chukchi Sea (Bockstoce, 1986), however, showed 7-yr and 14-yr cycles ($p<.05$). Results suggest that these longer cycles characterize the arctic as well as sub-arctic boreal.

**2:15 LONGER-TERM FAUNAL CYCLES IN THE EASTERN CANADIAN ARCTIC, John F. Wing and Donald J. Glazier, Wittenberg University, P.O. Box 720, Springfield, OH 45501.**

Are the ~10-yr and ~20-yr cycles restricted to the boreal? To test for this the detrended catch and fur records from Davis Strait, Ungava, Newfoundland and W. Greenland were subjected to contingency-periodogram and cross-correlational analyses. The oldest data series, 1719-1780, from Ross (1979) related to the simplest food chain: krill→whale. While no krill records are included, his Bowhead *(Balaena mysticetus)* data showed significant ($p<.05$) 9-yr, 20-yr and ~30-yr cycles; and his 73-yr record of U.S.-British catch for 1814-1886 also yielded a 12-yr cycle ($p<.05$). Another food chain is fish→seal→polar bear. We obtained significant ($.10<p<.01$) intercorrelations of $r=.30$-$.73$ for the catches of cod *(Gadhus morhua),* clawed lobster *(Homerus americana),* hooded seal *(Cystophera cristata)* and harp seal *(Phoca groenlandica);* and the latter catches were in phase with the polar bear *(Ursus maritimus).* Peridograms included significant ($.10<p<.01$) 10-12 yr and 20-24 yr cycles. A final food chain involves small mammals→arctic fox *(Alopex lagopus).* Elton's (1965) Ungava fox records yielded significant ($.05<p<.01$) 11, 22, 34 and 44-yr cycles as well as the more expected 3-4 yr short cycles. How much these longer cycles are reverberations of the shorter cycles and how much they are related to the fox's dependence on polar bear scavenging or weather cycles is not known; but such longer cycles in the fox also appear in Jones' (1912).

**2:30 EGG PREDATION ALONG A SUBURBAN-RURAL GRADIENT IN NORTHEASTERN OHIO. Eric Kershner, Margaret Jones, and Michael Melampy. Department of Biology, Baldwin-Wallace College, Berea, OH 44017.**

The intensity of egg predation in small woodlots was compared across three regions: (1) suburban Cuyahoga Co., (2) semi-rural Lorain Co., and (3) rural Huron Co. Artificial nests, each holding 3 Japanese quail eggs, were placed in 7 Cuyahoga Co. woodlots, 4 Lorain Co. woodlots and 4 Huron Co. woodlots. In all but the largest woodlot, 20 nests were placed at 25 m intervals along a linear transect. Seventy-four nests were placed in the largest woodlot. Half of the nests were placed on the ground, and half were placed in the lower branches of trees. Eggs were removed from 257 of the 354 nests. No significant difference in egg removal was found among the three regions, and no significant relation was found between woodlot size and egg removal. Eggs were removed from 90% of the ground nests and 55% of the tree nests. Although confirming the ground/tree difference demonstrated by Wilcove (1985), our results do not confirm the rural attenuation of egg predation that Wilcove observed.

**2:45 ARTHROPOD FOOD WEB RELATIONSHIPS ON FALL GOLDENROD (*SOLIDAGO* spp.) PLANT COMMUNITIES IN NORTHEASTERN OHIO. T.E. Worth & G.E. Klee, Dept. of Biological Sciences, Kent State University-Stark Campus, 6000 Frank Ave., NW, Canton, OH 44720-7599**

A Fall, 1991 study of the arthropod fauna of several species of goldenrod was made in Stark and Carroll Counties. Hand sampling yielded several spider species and various other arthropods, including several hymenopteran pollinators and predators, 1 Dipteran gall fly species and other Diptera, more numerous aphids and other homopterans, and characteristic coleopteran species. Comparisons are made between this work and other U.S. and European studies. Goldenrod arthropod faunas may accelerate grassland successional rates. Future work is planned on spring and summer faunas as well as additional goldenrod species and collection sites.

**3:00 SMALL MAMMAL COMMUNITY STRUCTURE AND HABITAT USE IN REMNANT AND RESTORED PRAIRIES. Melissa A. Jewell and Ihor Hlohowskyj, Argonne National Laboratory, Argonne, IL. 60439, and Douglas H. Taylor, Dept. of Zoology, Miami University Oxford, OH. 45056.**

Recent efforts in prairie restoration have dictated the need to better understand how small mammals utilize and respond to various habitat qualities and features within these prairies. The present study examined the relationship between small mammal populations and habitat characteristics in restored and remnant prairies at four northeastern Illinois prairie sites from April -November 1991. The prairie sites were similar in size (30-60 acres) and fire history. Plant species composition varied among the sites, but all were dominated by *Solidago* and *Aster* species in late summer. At each prairie site, a 100 station trapping grid (100m x 100m) was established and small mammals were live-trapped for three consecutive nights each month for a total of 2400 trap nights per site. Plant height and density, percent cover and litter depth were also measured monthly. Eight species of small mammals were collected among all sites during this study. *Microtus pennsylvanicus* and *Peromyscus leucopus* were the most commonly captured species. *M. pennsylvanicus* abundance showed a decrease with increasing litter depth at two sites, and most captures (>90%) at these sites occurred at litter depths <4cm. In contrast, *M. pennsylvanicus* at a third site was most abundant at litter depths >4cm. *P. leucopus* was most abundant at litter depths <3cm. Differences in available litter among the sites may account for these patterns. Vegetation heights at which most captures occurred ranged from 70-160cm for *M. pennsylvanicus* and from 100-160cm for *P. leucopus*. Neither species was collected from areas with vegetation less than 60cm in height. Work supported by the U.S. Department of Energy under contract W-31-109-ENG-38.

**3:15 SOIL CHARACTERISTICS OF REMNANT AND RECONSTRUCTED PRAIRIES IN MARION COUNTY, OHIO. Kathleen E. Cochrane and Ralph E.J. Boerner. The Ohio State University, Department of Plant Biology, 1735 Neil Avenue, Columbus, OH 43210-1293.**

Research was conducted to compare prairie communities in Marion County, Ohio. Soil was sampled from five sites to determine mean percent organic carbon and A-horizon soil color, two of many parameters which characterize a true prairie. The five sites sampled included three adjacent sites located on the Marion campus of Ohio State University: an agricultural field, a 12 year old reconstructed prairie and a field left unplowed for one and one half years (Yearling prairie). The two other sites were native prairie remnants, including Claridon located on a railroad right of way, and Bretz a pioneer cemetery. True prairies are expected to have mollic soil horizons with dark color and high organic carbon content. The reconstructed and the Claridon prairie sites had the highest mean percent organic carbon, 2.88% and 5.18% respectively. The three remaining sites contained, on average, less than 2% organic carbon, significantly lower than Claridon and the reconstructed prairie ($p < 0.05$). Differences in soil color at each site were fairly distinct. The proportion of samples classified as "black" or "very dark gray" decreased in the order: Claridon, reconstructed prairie, Yearling prairie, agricultural field, and Bretz Cemetery. Based on these parameters the results suggest that Claridon is the site most similar to a true prairie community and the 12 year old reconstructed prairie is progressing towards this status.

**3:30 ANNUAL VARIATION IN FEMALE REPRODUCTIVE EFFORT IN *ANDROPOGON GERARDI*. Taber D. Allison and Kathleen Cochrane. Department of Plant Biology, The Ohio State University, 1735 Neil Ave., Columbus, OH 43210.**

Several levels of variation in female reproductive effort were recorded for a population of *Andropogon gerardi* at the Marion Campus Prairie of the Ohio State University. Particular attention was paid to the effects of the drought of Summer 1991. There was significant annual variation in number of culms produced per plant, number of inflorescences per plant, and number of racemes per plant over the three year period. When compared to previous years plants in 1991 had fewer culms produced (down 25%), reduced inflorescence production (down 30%), and fewer racemes per inflorescence (down 33%). Seeds per sessile spikelet averaged 0.03 in 1991 compared to 0.51 in 1989. Fewer ovules were pollinated in 1991 indicating that the decline in seed production was due not only to reduced allocation to flowers but reduced levels of pollination as well. Comparisons in reproductive effort in 1991 were also made among several *Andropogon* populations in Ohio.

**3:45 SOIL EDGE EFFECTS AT THE FOREST-AGRICULTURE INTERFACE AT CAMDEN (BOG) LAKE, LORAIN COUNTY, OHIO. Heather L. Shank-Givens and Roger H. Laushman, Biology Department, Oberlin College, Oberlin, OH 44074.**

Edge effects are structural and functional differences at the interface of habitats. These effects have been documented for plant and animal distributions and microclimate, but little research has examined edge effects in soils. Camden Bog is a 24 acre preserve surrounded by agricultural fields. We established four transects perpendicular to the preserve edge, each extending 40 m into both the forest and agricultural field. Each transect included one of three soil types present at the bog. Soil samples, collected from the top 15-20 cm, were taken at regular intervals along the transects. Samples were analyzed for nine standard soil parameters (pH, P, K, Ca, Mg, CEC, BSCa, BSMg, and BSK) in three zones: forest, edge, and agriculture. Results show almost no within site variation. Edge was significantly different from forest and agriculture for pH, Mg, and CEC; and significantly different from forest alone for K, BSCa, BSK, and BSMg. Edge soils are more similar to agricultural soils than to forest soils. We are increasing sampling along transects to locate the forest region where edge effects attenuate. Soil organic matter, microbial activity and bulk density measures are being added to the study. These results will be used to make recommendations for habitat management and restoration.

**4:00 SEED BANK ECOLOGY OF A SUBMERGED PEAT MAT AT CAMDEN (BOG) LAKE, LORAIN COUNTY, OHIO. Alexander Tokar and Roger H. Laushman, Biology Department, Oberlin College, Oberlin, OH 44074.**

Camden bog lies 9 miles southwest of Oberlin, Ohio. In the 1950s, Oberlin drained Camden bog repeatedly to supplement its water supply—resulting in the destruction of the bog's floating peat mat and the disappearance of 38 species. The Ohio Department of Natural Resources lists 14 of those species as either potentially threatened, threatened or endangered. Six extirpated species have reappeared since 1990, possibly from the seed bank. The old mat that contained the richest species diversity now lies at the lake bottom. We assayed the seed bank by taking 60 cores (7cm diameter; up to 70cm long), four from each of 15 stations off the north and south shores. We spread each core 2cm thick in trays (18x30x4cm) half filled with potting soil. Diurnal temperatures were stratified and the plots kept moist. Ten more cores, length ca. 70cm, were taken from one station, divided into seven 10cm depth classes and treated as the cores above. We classified seedlings as either monocots or dicots pending further identification. Currently, 866 monocot and 74 dicot seedlings are growing in the first assay; 26 seedlings in the depth-stratified plots. Monocots germinate preferentially from shallow depth classes; dicots from deeper depth classes. We will present diversity indices to compare seedling germination within and between areas and depths of the old mat.

**4:15 CHANGING RESPONSE OF ANTS TO MYRMECOCHOROUS SEEDS. Kevin R. Cummings and E. Raymond Heithaus. Biology Dept., Kenyon College, Gambier, OH 43022.**

In myrmecochory seeds are dispersed when chemicals stimulate carrying by ants. We asked: Can ant response be satiated, and at what levels? Is this species-specific for plants or ants? Does exposure to one plant species influence ants' response to a second? Removal experiments used seeds of *Sanguinaria canadensis* (bloodroot) and *Asarum canadense* (ginger). Ten seeds were placed near ant nests, with removals noted at five 30-min intervals; removed seeds were replaced after each interval. Tests were repeated after 24 hr and one week, either with the same species or shifting from bloodroot to ginger. Seed removal declined sharply over 2.5 hr on Day 1, from 6.3 to 0.6 bloodroot seeds per half hour (N=11 ant colonies), and from 9.4 to 1.0 ginger seeds (N=5 ant colonies). Removal rates remained low 24 hr later. Seed removal per 2.5 hr was reduced from 15.7 to 1.9 on Day 2 for bloodroot and from 31.8 to 6.0 for ginger. Ants exposed to ginger seeds a week after taking bloodroot seeds responded at satiation levels (N=5 ant colonies). Removal rates were similar for four species of ants (*Aphaenogaster, Camponotus, Formica, Lasius* spp.). Seeds from one or two plants can satiate an ant colony (even very large colonies), creating density-dependence in dispersal success. Plant success in myrmecochory may be limited by ant behavior as well as ant density.

**4:30 THE EFFECT OF NATURAL DISTURBANCE ON HERB DIVERSITY IN SECOND-GROWTH FORESTS OF SOUTHERN INDIANA. Cynthia D. Huebner, Botany Department, Miami University, Oxford, OH 45056.**

The purpose of this study was to determine the effects of natural disturbance on herb diversity in relation to other non-anthropogenic factors in second-growth forests of southern Indiana. Fifteen environmental variables were measured for 46 sites (a study area size of about 35 ha of non-continuous National Forest land, 80 years of age or older) including canopy opening, which served as the measure for natural disturbance. Multiple regression analysis showed positive correlation between herb diversity and both seedling diversity and soil type. Canopy opening, slope aspect (degree of "southness"), landform (broad-flat ridges and south-facing slopes were less diverse than coves and north-facing slopes), and number of standing dead trees were negatively correlated with herb diversity. Water stress was likely to be related to the low herb diversity and high species' dominance associated with increased canopy openings and south-facing slopes and ridges. Mesic sites were more species rich than xeric sites but had lower herb cover and different species. Data sets such as this one provide the baseline information necessary to examine anthropogenic stresses on herb diversity over large scales.

**4:45 MORTALITY AND REPLACEMENT OF CANOPY TREES IN OLD-GROWTH STANDS IN OHIO AND PENNSYLVANIA. James R. Runkle. Dept. of Biological Sciences, Wright State University, Dayton, OH 45435.**

I used the point-centered quarter method to sample canopy trees (by definition, ≥ 25 cm diameter) in several eastern USA old-growth forests in 1976-1977. Two such sites are Hueston Woods, OH, and the Tionesta Natural Areas, PA. In 1990-1991 I relocated trees in both stands, remeasured their diameters, indicated whether they had died, and, if they had died, measured the living tree in their quarter now closest to the center point. Altogether I relocated 408 trees in Hueston Woods and 387 in Tionesta (sampling away from the 1985 blowdown). Annual mortality rates were 1.23%/yr for Hueston Woods and 0.68%/yr for Tionesta. Mortality rates were greater for large stems than small stems. In Hueston Woods beech decreased in overall importance while tuliptree, white ash, and sugar maple increased. In Tionesta beech showed the largest **increase** while hemlock and sugar maple decreased. Overall, species compositions for the two sample dates were 95% similar for Tionesta and 91% for Hueston Woods.

## R. Ecology
## Poster Session
## Saturday, May 2, 1992
## College of Business Administration Concourse

**BOARD J**

**10:00 DETERMINATION OF FOREST DECLINE WITHIN THE HAMILTON COUNTY PARK DISTRICT. Thomas L. Vierheller, Division of Biological Sciences and Related Technologies, Prestonsburg Community College, Prestonsburg, KY 41653; Carolyn H. Keiffer and Judith K. Jardine, Dept. of Environmental and Plant Biology, Ohio University, Athens, OH 45701.**

During the past decade Hamilton County Park District personnel have noted a general decline of the forest stands within their jurisdiction. Based on park personnel observations, sugar maple *(Acer saccharum)*, ash *(Fraxinus spp.)* and oak *(Quercus spp.)* are believed to be most affected. The decline had been categorized as most severe at Shawnee Lookout Park and least severe at Woodland Mound Park. A study of woody vegetation and a soils analysis was conducted in the summer of 1991 to determine the extent of decline at each park and identify differences between the two parks.

**BOARD K**

**10:00 BENTHIC MACROINVERTEBRATES AS INDICATORS OF WATER QUALITY IN THE LITTLE MUSKINGUM RIVER. Debra L. Keller and John H. Olive, Department of Biology, The University of Akron, Akron, OH . 44325.**

Benthic macroinvertebrate communities were sampled at five stations on the Little Muskingum River to assess the water quality. Several potential sources of pollution exist in this region including organic enrichment due to run-off from farms and leaching from domestic sewage systems. Agricultural development near the river also creates the potential for pollution by agricultural chemicals and increased erosion of soils into the river. The river watershed has a high density of active oil/gas wells including exempt Mississippian wells which release brines into the river. Qualitative and quantitative analysis of the macroinvertebrate community structure using standard biotic indexes indicate that measurable degradation has occurred at three of the stations. Two headwater stations are impacted little and meet or exceed U.S. EPA standard water quality criteria. Two mid-range stations show relatively low density of organisms, low numbers of intolerant taxa *(Ephemeroptera, Plecoptera, Trichoptera)* and low numbers of total taxa. This suggests significant organic enrichment and possible chemical impact. The station farthest downstream has an extremely high density of macroinvertebrates, high numbers of intolerant taxa and high numbers of total taxa. Diversity is low, however, because the community is dominated by large numbers of chironomids and black fly larvae. The large numbers of tolerant and intolerant organisms at this station are indicative of a recovery area with mild organic enrichment.

**BOARD L**

**10:00 NOVELTY IS NOT A BASIS FOR GENERALIZATION IN PREY SELECTION BY GOLDFISH. Craig W. Steele & Carol Skinner. Department of Biology & Health Services, Edinboro University, Edinboro, PA 16444.**

Research on avoidance generalization in goldfish could advance our understanding of foraging behavior in "higher" vertebrates and our understanding of the evolution of abilities associated with "higher brain structure" from simpler neural systems. Forty goldfish, *Carassius auratus*, were divided randomly into 4 treatment groups (n=10, each). Fish in 2 experimental groups and 2 control groups were trained on either red or green food pellets (one experimental and one control group, each) for 7 days. Fish were then given a choice between equal numbers of the familiar food and yellow food pellets, once per day for 4 consecutive days. In the experimental groups, the yellow pellets were soaked in a 15% quinine hydrochloride solution to make them unpalatable. During the next 4 days, fish were presented with equal numbers of their familiar food and a second novel food pellet. Neither controls nor experimentals showed any reluctance to sample novel foods or to eat significantly more familiar than novel pellets when both were palatable, except the red-trained controls, which ate significantly fewer green pellets than red or yellow ones. The significance of this finding is not immediately apparent. Experimental fish ate significantly fewer unpalatable pellets, although they continued to sample them extensively. The experimental fish were apparently unable to generalize from their experience with the unpalatable novel pellets.

## S. Info. and Library Science
## Only Morning
## 9:00 am, Friday, May 1, 1992
## Gardner Student Center Chestnut B
## Robert Rittenhouse, Presiding

**9:00 A FRAMEWORK FOR ETHICAL DECISION-MAKING IN THE INFORMATION PROFESSIONS. Thomas J. Froehlich. School of Library and Information Science, Kent State University, P.O. Box 5190, Kent, OH 44242-0001.**

In this paper, a general framework for addressing ethical issues in the information professions will be developed. It will have two aspects: a consideration of (1 ) factors that affect ethical decisions and (2) principles to which librarians or other information professionals may appeal to make a decision. The factors are a list of elements that often surround particular issues; the principles are often invoked to allow the decision-maker to balance, weigh or ignore certain factors, to set priorities and to come to a decision regarding a particular problem. The factors include: (1 ) social utility, (2) social responsibility, (3) organizational survival, (4) professional survival, (5) respect for self, (6) respect for other individuals and institutions, (7) community standards, and (8) legal standards. The principles include: (1 ) act in such a way that the amount of harm is minimized; (2) respect the autonomy of self and others; (3) seek justice or fairness; (4) seek social harmony; and (5) be faithful to organizational, professional and public trust. With an explanation of these factors and principles and their interaction, there will be specific examples from such diverse areas as issues in reference services, intellectual freedom, the use of consultants, the installation and use of CD-ROM networks and end-user searching.

**10:00 BARCODING—SOME HUMAN AND OTHER FACTORS. Dale Ebersole, Jr. Carlson Library, University of Toledo, Toledo, Ohio 43606.**

An individual's physical characteristics and adaptability influence the amount one can do. The use of one hour periods and changing tasks can help. The application of smart barcodes is enhanced by a familiarity with the construction or use of call numbers. For identification only the cutter portion of the call number is normally required. More books will receive barcodes in an hour if 2 or more volumes are taken off the shelf at the same time. The use of light weight, portable typing tables will aid in the handling and/or sorting of large and small volumes. Serials and multi-volume sets have significant problems with the use of smart barcodes. The impact of cataloging changes and labeling or other errors on the ease of processing are noted. New items and those with single volume holdings require effort as volume identification must always be added for identification of the item. One goal is to keep handling of any title's volumes to a minimum.

**10:30 CENSUS POWER, A USER FRIENDLY CENSUS CD-ROM INTERFACE. Dennis P. Brinton, Brinton & Associates 2951 8th Street, Cuyahoga Falls, Ohio, 44221.**

The Bureau of the Census has initiated a program of releasing 1990 Census products on CD-ROMS. This has the potential to make this data available for a wide variety of purposes, however the current user interface provided by the Census Bureau is not powerful enough to exploit the full potential of this data. This is a particular problem in library settings, where librarians are hard pressed to meet patron needs with the Census Bureau supplied software. CENSUS POWER is a census CD-ROM user interface currently under development, which provides powerful and flexible access to this data. It is designed to be used by both library staff and the general public with a small amount of training. The paper describes the problems and pitfalls in the development of this program and its evolution to the current version. It includes a public demonstration of the current version.

**11:00 ACCESSING MAPS WITH GRAPHIC MAP INDEXES OR GEOGRAPHIC DATABASES: A COMPARISON AND SOME OBSERVATIONS. Edward J. Hall, Map Librarian, Kent State University Libraries, Map Library, 410 McGilvrey Hall, Kent State University, Kent, OH 44242-0001.**

Map and geology librarians today generally employ graphic map indexes and/or geographic database indexes to retrieve information about maps in major map series. The best known examples of graphic map indexes are those produced by the Army Map Service for their 1940 and 1950 map series. The best known geographic database map indexes are GEOINDEX (United States Geological Survey), CARTO-NET (British Library Research and Development Department), and GEODEX (American Geographical Society). There are advantages and disadvantages to graphic map indexes but the development of geographic database indexes has relegated graphic map indexes to the category of supplementary indexes. The geographic database indexes such as GEODEX, GEO-INDEX, and CARTO-NET are more comprehensive, functional and flexible. They may also be used as government document item records, an important consideration. This paper compares the two categories of indexes and makes some observations about their usefulness.

## S. Info. and Library Science
## Afternoon & Business Mtg.
## 1:15 pm, Friday, May 1, 1992
## Gardner Student Center Chestnut B
## Robert Rittenhouse, Presiding

**1:30 PATTERNS OF CD-ROM DATABASE USE AND THEIR IMPACT ON USER INSTRUCTION: SOME PRELIMINARY OBSERVATIONS. Bruce Leach, Biological Sciences Library, Ohio State University, 1735 Neil Avenue, Columbus, OH 43210.**

Virtually all CD-ROM database use in the Biological Sciences Library is recorded in a daily workstation "reservation" log. Workstation logs from July 1989 through June 1991 were entered into a *WordPerfect* file, sorted by name and date, then edited. 935 unique users were identified. 42% used databases only once during the two-year period. An additional 20% had multiple uses, but all within one academic quarter. Results reinforce the idea that brief, point-of-use instruction is an important part of a CD-ROM user instruction program.

**1:45 SCIENCE-TECHNOLOGY LITERATURE AS TAUGHT IN A LIBRARY SCHOOL. Ann D. Bolek. ScienceTechnology Library, The University of Akron, Akron, OH 44325-3907.**

As time goes by, the science-technology literature proliferates as do the methods of accessing it. How much can we expect students to absorb? Practicing librarians know that we are constantly learning how to search new CD-ROMs and online systems and enhancements to existing CD-ROMs and online systems. Soon, OhioLINK will replace our existing online catalogs which we have worked so hard to establish.
During the Fall of 1991, the writer taught "Science-Technology Information Sources and Services" in the School of Library and Information Science at Kent State University. The writer was given an existing bibliography which needed updating. Each week a different area of science was covered including one week on engineering/ technology and another on medicine. Emphasis was placed on using indexes as well as answering reference questions. When the appropriate CD-ROMs were available, students were given assignments on them also. The course culminated with student presentations, a project (bibliography on a particular topic), and a final exam. The presentation will include innovations used to encourage the students to work hard, but also enjoy their learning experience.

**2:15 MEETING FACULTY EDUCATIONAL NEEDS THROUGH CHAUTAUQUA SHORT COURSES. Anna Maria Barnum, Division of Associate Studies, The University of Akron, Akron, OH 44325-6105.**

The cross disciplinary nature of the Chautauqua Short Courses for College Teachers makes them a desirable means of updating faculty knowledge and understanding. The trend in the organization of science and of science information and information systems is toward increasing specialization and a proliferation of nomenclature bordering upon the arcane. Concurrently, some of the barriers between the hard and soft sciences have all but disappeared. Increasingly faculty will need access to the most modern thinking in a variety of subject areas and in a format designed to be efficient for teachers and researchers who have severe time constraints. Because Chautauqua Course Directors are recruited from among the outstanding teacher/scholars in their fields, and because the courses are held at a variety